73 magazine

for radio amateurs

$1.00
April 1972
26009

FUN MODE

WORLD REPEATER LIST ALL 50 STATES AND 8 Foreign Countries.

EQUIPMENT REVIEWS

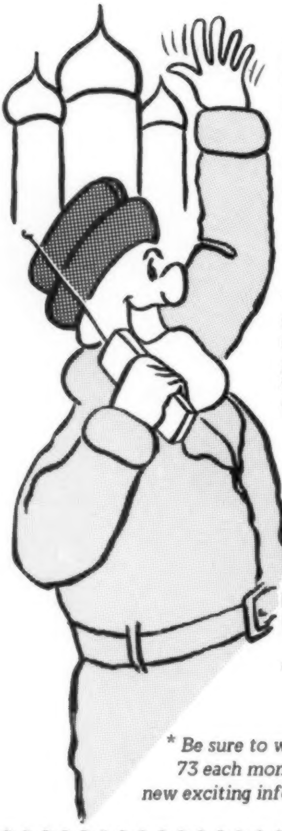
Drake TR-22
Ross & White BND
Comcraft CTR-144

LATE NEWS

- 73 EUROPEAN TOUR INCLUDES MOSCOW
- FCC INSIDE SCOOP
- BIG MOVE TO SAVE 220 MHz
- FM SYMPOSIUM A SUCCESS
- NOVICE NEWS
- 50 MHz NEWS
- DX NEWS

73 GOES TO MOSCOW

3 week ham oriented tour of Copenhagen, Berlin, Moscow, and Amsterdam.



Here's your chance of a lifetime to realize the amateur radio operator's dream of touring the great European capitals, yet not missing out on valuable hamming time. Think of it – sending CQ's from Rembrandt's bedroom – contacting rare DX from the top of Tivoli's highest roller coaster – bleeping 94 direct from the middle of Red Square! Nirvana.

Seriously, this could be the most thrilling trip you'll make. You will be with other hams, people who are interested in the same things you like. You can exchange eyeball QSL's with your DX friends. If our plans go through you will be able to operate from a private or club station in each city. And you can argue with a captive Wayne Green for three whole weeks. What could possibly be more soul satisfying?

Well, maybe all the traditional joys of Europe. There are gourmet restaurants, quaint hotels, elegant nightclubs, famous art museums, unusual shopping bargains. Since this is not an "organized" tour, you can discover all these things in your own way and at your own pace. Spark a romance beside the Amsterdam canal, carouse all night in Copenhagen, climb the Berlin Wall – we won't bother you. But we'll be there to help if you need it.

The Schedule:

Monday, September 4	New York City to Copenhagen
Sunday, September 10	Copenhagen to Berlin
Friday, September 15	Berlin to Moscow
Wednesday, September 20	Moscow to Amsterdam
Monday, September 25	Amsterdam to New York

Each of these cities holds an active ham group. Plans are to have a hamfest or banquet at each stop, so that you can really tune in on the European ham situation.

Plan now to be free in September. You will never have a better chance to go on a trip that fulfills your wishes so exactly.

YES! I am interested in going on this fabulous tour.

☐ sign me on. I enclose $200. deposit (returnable)

☐ send me more information

Name ______________________ Call ______

Street ______________________

City ______________________

State ______________ Zip ______________

** Be sure to watch **
73 each month for
new exciting information

$$$$$$$$$$$$$$$$$$$$$$$$$

ONLY...

$700.00 for single, $1300.00 for couple traveling together includes – air and ground transportation, lodging, breakfasts, hamfests and banquets.

73 magazine
for radio amateurs

#139 APRIL 1972

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73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $6 for one year in North Ameria and U.S. Zip Code areas overseas. $7 per year elsewhere. Two years $11 in U.S. and $12 overseas. Three years $15, and $16 overseas. Second class postage paid at Peterborough NH, and at additional mailing offices. Printed at Menasha, Wisconsin 54952 U.S.A. Entire contents copyright 1972 by 73 Inc., Peterborough NH 03458. Phone: 603-924-3873. Say, you might give serious thought to joining the 73 tour to Moscow, Berlin, Amsterdam and Copenhagen coming up in September. This will be a lot of fun and provide you with memories to last a lifetime. The 73 staff, including Wayne, will be at the Dayton Hamvention and can answer any questions you have at that time. Don't miss Wayne on the DX program with slides of Jordan and King Hussein as well as on the FM program with hot FCC news and a plan to save 220 MHz for hams.

Amateur Radio

APRIL MCMLXXII Monthly Ha

HAMS AID IN SEARCH

On Saturday, January 22, 1972, St. Louis area amateur radio operators were called to assist in the search for a young man missing from his residence at the St. Louis State School and Hospital. The young man was retarded and partially blind.

Initial efforts to locate the youth were spearheaded by volunteers from the local Youth Association for Retarded Citizens (YARC). After 24 hours of search, YARC leader Tyrone McNary contacted county police seeking walkie-talkie radios. Sargent Joe Owings, Police Radio Supervisor and ham operator, was on duty at the time and immediately contacted members of the St. Louis Repeater Club to request their cooperation. One of the primary functions of the club is to provide emergency communications using VHF equipment owned and maintained by the members.

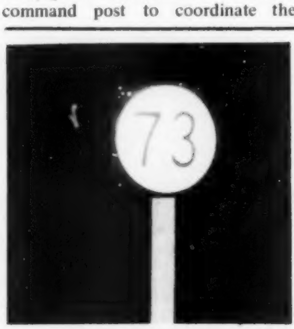
Lionel Doak K0DCQ and Clarence Herron, Jr., W0KUJ instituted call-up procedures, and within thirty minutes a dozen hams equipped with mobile radios and portable units headed for the search area. Bob Netherton WA0QAH established a radio command post to coordinate the YARC search groups. Other hams with portable transceivers were assigned to specific search parties. The command post was transferred to Sgt. Owings' radio-equipped camper van when he arrived after duty hours. Darkness forced the search to be called off for the night.

Sunday morning additional hams, YARC members, Scouts, and other volunteers gathered at the radio command post to continue the search. Each group of eight to ten walkers included a radio operator. Mobile operators visited area churches and homes to inform the public, with a description of the youth. Many of the YARC volunteers had been working with little rest since Friday afternoon.

Unfortunately the story did not have a happy ending. The body of the youth was found in a creek bed only about ¼ mile from the school grounds. However, the dedication displayed by the young adult YARC group was an inspiration to all. Their volunteer work with retarded citizens usually goes unnoticed. Their involvement and compassion was evident throughout the search and especially when the sad end was known.

In the future, it is recommended that authorities faced with an emergency contact radio amateur volunteer communication specialists just as soon as the requirement for assistance is known. The search was into the second day before the St. Louis Repeater Club members were contacted.

Radio operators who participated include Joe Owings K0AHD, Lionel Doak K0DCQ, Clarence Heeron, Jr., W0KUJ, Robert Netherton WA0QAH, Robert Wingerter K0ABA, Robert Familton WA0QOL, William Armstrong W0NC, Randy Wachter WB0CPG, Marianne Familton WA0QOM Forrest Murphy W0FEM, Vernon Hayes W0CYF, Neil Widener WA9OTB, Ralph Edmonds W0KUY, John Landsberger K0LUX, Dennis Hutchins WA9RDY, Bill Reichert WA9HHH, Royce Brown WA9UUF, John Carrel WA0ITI, Joe Rome K0PJB, and Robert Silvey WB9CDF.



Arnold Krauel WA0GUD, was there when 73 stretched out its wings and claimed the land 11 miles east of Audubon, Iowa. As you walk down the State Road 73's of life, watch out for the next place 73 strikes. Keep your camera ready.

ECARS PREXY

Hal Winston W2DIR on January 15th assumed the position of President of ECARS, the East Coast Amateur Radio Service. 73 Magazine extends its hearty congratulations to Hal and wishes him the best of luck in this position.

JOHN K3BNS NEW CHIEF OF RULES & LEGAL BRANCH, FCC

Reprinted from the X-Mitter, Penn. Wireless Assoc.

John B. Johnston K3BNS, has been appointed Chief, Rules and Legal Branch, Amateur and Citizens Band Division, of the Federal Communications Commission, effective 14 February 1972.

John will be working under Prose Walker W4BW, the head of the amateur and citizens branch of FCC. He replaces Bill Grenfell W4GF, who retired early in 1971.

John was first licensed as KN2HHR, becoming K2HHR and later K8DAI before moving to Levittown as K3BNS. He is a past president of Penn Wireless Association, past president of Frankford Radio Club, and has received numerous awards for his amateur radio activities. He has received the ARRL CD Article award, and has had many articles published in QST, X-MITTER, CQ, and 73. He is a Life Member, ARRL, and ex-Assistant Director. John is active on all HF bands on CW, RTTY, and phone. He places high in Sweepstakes and the DX contests.

SYMPOSIUM DISCUSSES FCC RULES

Representatives of New England and Eastern New York repeater groups discussed FCC regulations which they thought would be beneficial for the orderly growth of two meter FM.

The first item to be brought up was the matter of the frequency of control systems. Under the present regulations all control systems must be on 220 MHz or above. This rule has been around since some time in the 30's or 40's and has been a great big pain with little redeeming merit. Suggestions were made that all restrictions be removed regarding control frequencies and that the end result be defined instead of the means of achieving it. The result is effective control of repeaters in this case.

It was proposed that control be permitted from mobile points. Considerable discussion brought out that there seemed to be no reasonable argument against permitting mobile control of repeaters. The negative thinkers came up with a wide array of improbable difficulties which might demand fixed control points. The positive thinkers countered each negative thrust and won the vote of the majority.

The same discussion got started on the subject of monitoring and whether mobile monitoring should be permitted. The heretical question was raised as to whether monitoring was in all cases absolutely essential and the majority was again persuaded that under certain conditions such as coded access to the repeater no monitoring should be required. Completely open repeaters should be monitored.

The group agreed that unattended repeater operation be proposed to the FCC.

The matter of control of a repeater brought forth a good deal of opinion and some heat, finally being resolved after much compromise with the recommendation that primary control of repeaters be on 220 MHz or above or by means of telephone wires or some other such hard wire control. Primary control was defined as the ability to turn the system on and off. Secondary control or emergency control was defined as the ability to shut the system off or change its functions.

The group also voted to support the petition that has been under consideration by the FCC for some years now for extending Technician operation to the entire 144–148 MHz band.

The group voted a preference for 40 kHz spacing between channels on the 220 MHz band instead of the rumored RACES desired standard of 30 kHz. The wider spacing would be in keeping with equipment expected to be available soon to amateurs and would permit the eventual splitting of channels down to 20 kHz without undue adjacent channel interference. The 30 kHz standard now in use on 146 MHz has caused great grief when split further to 15 kHz and this disaster might avoid repetition if RACES would go along with the repeater groups and agree to 40 kHz spacing. Equipment can be made for 15 kHz spacing, but it would be expensive . . . very expensive.

NEWS FLASH

Reprinted from the February *Ham Rag*

As we go to press, Ham Rag's nosy reporters have smelled out a scandal at ARRL Headquarters. Seems that ARRL President Robt. W. Denniston W0DX, has been out beating the bushes in opposition to ARRL's proposal for phone band expansion, so the League has fired W0DX and replaced him with Harry J. Dannals W2TUK, Director from the Hudson Division, as Prexy.

CLUB 18 YEARS OLD

RSBG RadCom – The Radio Amateur Invalid and Bedfast Club, now has close to 400 members in 13 countries and will celebrate its 18th anniversary next year. It extends a welcome to licensed amateurs and SWL's anywhere who are handicapped in any way. Membership is free and the club's newsletter, *RADIAL*, is sent monthly for a small sum to help cover printing and mailing costs.

Inquiries should be addressed to the honorary secretary, Mrs. Frances Woolley G3LWY, Woodclose, Penselwood, Wincanton, Somerset, England.

DYCOMM DEMAND

A letter from attorneys representing Dynamic Communications demands that 73 publish a retraction as follows:

> The models advertised on page 106 of the February edition were incorrect, that they were both discontinued as of January 5th, 1972, and that new models and new prices were in effect from that day forward.

We do try hard to see that only ads that are wanted are run. In the case of Dycomm a proof of the ad was sent with the following statement: "Here is a rough proof of your ad for the February issue of 73. There will be time for us to send further proofs and get your okay on any changes or corrections if we receive your material by December 10th. We cannot guarantee proofs subject to corrections on material received between December 10th and 20th. Contract advertisers do not require an insertion order. As per contract agreement, below shown proof will appear in the February issue. Absolute ad deadline for negatives, changes and corrections is December 20th."

Though this proof was sent to Dycomm on December 5th, no word of any kind was received from them before the issue went to press. The next letter received was from their attorneys demanding a retraction. Had 73 received any communication whatever from Dycomm, by phone, letter, telegram, etc., the ad would have been cancelled. No word was in fact received.

ACTION AUCTION

With a title like the "Action Auction," the Montgomery ARC must be planning a big turnout. The auction will be held at the Civic Center in Gaithersburg on Sunday, May 14. Bring your gear from 10 to 12, and the auction will begin at noon. Talk-in on 94.

HAVASU HIGH SCHOOL HAMS

Left to right: Randy Strange; Gary Keller; Tom Clark; Howie DiBlasi, Instructor, of WA7RTM, the Lake Havasu High School Amateur Radio Club. The club recently handled 200 messages for students and faculty to all parts of the world. Traffic was passed to 25 states and many foreign countries.

ADDITIONS TO TECHNICAL AID GROUP

(see March '72 *73*)

Joseph Botwinick WA2UVD 137-45 231 St., Laurelton NY 11413. Project coordinator. Joe can lend a hand with AM, antennas, Novice problems, converters, test equipment, surplus and other general help.

Jim Venable K4YZE, 119 Jancey Dr., Marietta GA 30060. Jim is well qualified to lend assistance in VHF-UHF design of transmitters and receivers and antennas as well as being adept with test equipment and solid state matters.

QSL MANAGER OF THE MONTH

Scott's QSL service and DX Assn. is proud to announce the recipients of the QSL Manager of the Month golden microphone trophy. Each month since September 1970 one of the following managers was awarded the trophy for outstanding service. ZL2AFZ, VE3EUU, W7VRO, WA3HUP, W3HNK, KH6GLU, 1NDXA (K3RLY), W3CTN, WA6AHF (xyl Fern), WA2DWE, WØQGI (WAØ buro), W5QMJ (W5 buro), WB8ABN, W2MZV (Browning DXped mgr), W2GHK (DOTM), WA6MWG, KØZFL (K, WB, WN Ø buro), K4ZCP.

By Philadelphia Hams

TV NET FORMED ON 439 MEGAHERTZ

Paul Rilling WA3HIT

A new net was started on Friday, January 28, 1972 by net control K3ZKO Ron Cohen of Philadelphia. What makes this net unique is that it is a TV net (fast scan). Sponsored by the Mt. Airy VHF Radio Club, Inc. (Pack Rats), the net meets each Friday from 7 to 10 P.M., Philadelphia time. Ron (who is known as "Captain Video") believes that this is the first TV net to be formed in the East, and the first of its kind anywhere in the U.S. The frequency is 439.25 (video *and* audio). Philadelphia hams call this frequency "Channel 13¾." If you cannot copy K3ZKO-TV, look for WA3AXV-TV, whose handle is also Ron. K3ZKO will run test with those stations who wish, as well as listening on 146.58 MHz (2 meter FM ATV engineering channel) for those who can only receive but want to take part. Both Ron K3ZKO and Paul WA3HIT have color receivers for those who want to run tests while transmitting in color. Anyone can receive this net on a conventional TV set with a modified UHF converter (frequency adjusted 30 MHz at low end). Ron K3ZKO expects about twenty ATV stations from New Brunswick, N.J. to Westville, N.J. to be regular check-ins each week, and many more stations on 146.58 FM, who are monitoring only.

NEWS FROM AROUND THE WORLD

According to a newsletter of the Canadian Amateur Radio Federation, the age limit for the Amateur Experimental Service has been dropped, the eleven meter band is to be turned over to the exclusive use of the General Radio Service, and the Ministry of Communication is considering the lowering of qualifications necessary for amateur radio operators and creation of a new class of junior license restricted to operation in a UHF band and an output of three watts. This last item is particularly interesting as the CARF feeling is that any matter about amateur radio should have the approval of all licensed amateurs. Until all facts are known, however, concerned persons should not condemn the Ministry. There is the possibility that this Restricted Amateur license will promote the development of 450 MHz equipment. This will be a worthwhile event to follow.

NJ AMATEUR OF THE YEAR

On January 21st, Anthony Butterhof K2JOX, was presented with a plaque and cash award in recognition of his many years of service to the southern New Jersey area hams. His dedication to ham radio has been demonstrated many times over the years.

He has served as president and member of the Board of Directors of the Southern Counties Amateur Radio Association, has served onany committees, participated in many SCARA activities and programs. In 1971 he organized several transmitter hunts, promoted club activities, was prime mover during Field Day, technical advisor in the installation and operation of the club repeater, and served as chairman of a special committee that established WX2MAP, the special events station that operated in conjunction with the Miss America Pageant. Anthony acted as coordinator between the Pageant officials and the amateur club. He provided for acquisition of material and installation of the antenna and radio equipment for this station, participated in the operation of this station, and coordinated the QSL card efforts for the event.

Currently he is the committee chairman of the Kiwanis International special events amateur radio station, due to become operational this year. He has organized code and theory classes for prospective Novices at the local high school. And he has held many positions in local and county Civil Defense organizations.

The award is presented each year by Atlantic City radio station WFPG to the outstanding amateur in the southern New Jersey section.

METRO SNO-DO 100

By Al Molden VE3CLE

Reprinted from the Toronto FM Society Bulletin

After a delay of one week, Metro's first recorded snowmobilathon took place February 5.

Presented by several Metro area Civitan clubs, the Sno-Do took place over a hundred-mile course. Similar to a walkathon, but run on snowmobiles, it offered snowmobile owners a fund raising, fun-type endurance test for their machines. It was not a contest, but each entrant was asked to obtain sponsors who paid for each mile completed. All monies were equally divided between the participating clubs, whose common objective is to fight mental illness and help mentally retarded citizens.

Point-to-point communications on the rally was organized and carried out by the Toronto FM Society. They filled in the snowmobile/mobile end where a lack of ham manpower was evident. Four FM mobiles, those of Stan VE3AZD, Dan VE3CIQ, Barry VE3FBH, and Ray VE3GSK, were positioned at strategic points along the course, and track was kept of the position of each snowmobile as the day progressed. The base station was supplied by Chuck VE3KQ and ably manned by Al VE3CLE.

It was a good day for hams and snowmobilers alike. Without ham help, the event could not have been as successful as it was – other clubs are encouraged to lend support whenever and wherever reliable communications are needed.

HOT GEAR

On Feb. 3, 1972, YAESU Model FT-101 Transceiver, S/N 107036, equipped with CW filter, was stolen from the automobile of WA2YSW while it was parked in the driveway of his home. Contact Frank W. Widmann, 328 Farwood Road, Haddonfield, N.J. 08033, or Officer Latham, Police Headquarters, Borough of Haddonfield, 242 Kings Highway East, Haddonfield, N.J. 08033.

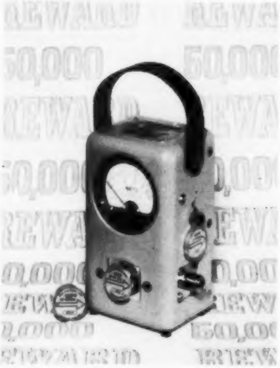
A 2 meter FM Standard Transmitter SRC 806M, Serial Number 102703, was stolen from the car of Clem Mathias W6NPV on January 25, 1972. Contact him at 3134 Coronado Ave., Imperial Beach CA 92032.

In Elmira, N.Y., Glen WB2LRR reports a Drake ML2, Model No. 20189 100N PL, stolen.

List from Past Issues:

Mfr., Model, Ser. No.	Owner	Issue
Halli, SR46A, No.446100	WA1EMU	9/71
Reg., HR-2, No.04-03505	WA5BNM	11/71
Sonar, FM3601, No.1003	WB2ARM	11/71
Coll., 75A4, No.804	W0MGI	12/71
GE, Portable, No.1041218	K2AOQ	1/72
Coll., 75SE-B, No.15640	Col.St.U.	1/72
Coll, 21S3, No.12000	Col.St.U.	1/72
Coll., 516F1,No.1649	Col.St.U.	1/72
Simp. Mod-A, No.35457	W2PWG	1/72
SBE SB-33 No.103906	WA5JGU	2/72
Heath HW22A No.907-1835	W1BDX	2/72
Nat'l HR050 No.280019	WA5DOF	2/72
Halli., SR160 No.416000-108039	K9YVA	2/72
Drake TR3 No.3858	WA9EYL	2/72
Coll., KWM2A No 13815	ARRL HQ M. Godwin	2/72
Coll., 312B4 No.59920		
Coll., 30L! No. 40084		
Coll. MPL No. 44507		
Coll. MM1 (mob. mike)		
Misco minispkr.	Sgt. Hopkins Wilm. DE Police	2/72
Swan SW174 No. 416-5	W0AXT	2/72
Reg. HR2A No.04-05896	K4GBL	2/72
HR2A, No.04-6208	W5FXX/5	3/72
Heath SB102,No.132-128107	W.Singer Woodbridge VA 703,491-2257	3/72

BIRD OFFERS REWARD



Bird Electronic Corporation offers a reward to twenty owners or users of a model 43 THRULINE RF Directional Wattmeter. Designed under the direction of the late microwave pioneer J. R. Bird when the industry was in its infancy, production of the famous "43" has just passed the 50,000 mark. This portable insertion wattmeter measures from 1 to 10,000 watts from 0.45 to 2300 MHz in discrete bands determined by the plug-in element used.

In celebration of the 50,000th unit, Bird will give away 20 standard plug-in elements to serial numbers taken at random on 10/10/72. Users selected will choose their element according to desired frequency range and full-scale power level. Mail the serial number of your model 43 on a card to *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon), Ohio 44139.*

THE 50 MHz BAND

by WA0ABI

The December openings started off with a bang early in the month, giving rise to hopes of another period similar to 1967 but after openings the morning and evening of the third and the evening of the fourth things calmed down. While there were multiple openings, they were of short duration and rather spotty. WA2ENZ and WB2BLL joined in a ragchew with K0RIR, W0RVF and WA0ABI on the 20th while on the following day VE1's were heard but were too far down in the noise to work.

Word has it that the 1972 meeting of the Midwest VHF Society will be held in Kansas City, but no date has been set as of this writing. Hopefully a date will be announced shortly so those who must schedule their vacations well in advance will be able to make the necessary arrangements. Several people from this area were forced to miss the 1971 meeting in Sioux Falls due to inability to arrange time off from work. A Kansas City trip is in the planning stage; hope to see you there.

There is good news for those in need of a Kentucky confirmation.Ted WB4VLH, is newly active from Paducah with a Clegg Venus and a pair of 4X150's. Ted joins Dave WB4YIH, who has been on for some time from Owensboro as K9DZK/4. These are the only Kentucky stations ever heard from this midwest location. W5SXJ was heard aeronautical mobile on both legs of a business trip through the St. Louis area. Ray seemed to be having a ball making contacts at the drop of a hat and at times rag chewing over a four state area.

Mike W0ZYS, is QRX while the tower is being moved to a new QTH and should be back on the air shortly.

Several Heath SB-110's around have developed a habit of jumping from 1 to 1½ kHz, in each the problem started abruptly and after the rig was several years old. In each case the problem was found to be in the heterodyne oscillator circuit. Should you have this problem, blow about $2 and replace all the resistors and capacitors in these circuits at one time. This may seem wasteful and you may never know which component was defective but it is far better than removing the shielding and bandswitch to replace components one at a time.

Your assistance in supplying current, factual reports of activity are needed to keep the column interesting and useful. I would also like to receive your comments as to what you would like to see in this space. Unless you speak up, you'll have to put up with my findings.

HAM TUNES IN TO BURROWING BURGLARS

by Henry Maule

Reprinted from the Knoxville (TN) Journal

Robert Rowlands is a prosperous 33-year-old company director who maintains an elegant apartment in London's West End. Like many a hard-working businessman, Rowlands relieves the pressure with a hobby. He's a radio ham.

At 11 o'clock one seemingly quiet Saturday evening not long ago, Rowlands turned on his high-powered equipment and began reaching into the ether for another ham, preferably someone far off. Perhaps he might even wind up chatting with none other than Jordan's King Hussein, who escapes from the woes of the troubled Middle East by doing a little radio hamming himself.

As luck would have it, Rowlands' short-wave receiver was tuned in on 27.5 megacycles. This was precisely the frequency of a set of walkie-talkie radios being employed, at that very moment, by an enterprising gang of bank robbers who had tunneled their way into Lloyds Bank branch on nearby Baker Street.

The bank is situated only a block from 221B Baker Street, the address of Arthur Conan Doyle's famous fictional detective, Sherlock Holmes. Ironically, although their equipment was ultra modern, the thieves were employing the same technique of the robbers in Doyle's story, "The Red-Headed League."

The non-fiction gang tunneled 15 feet downward from a vacant store two doors from the bank. Then, with picks and shovels, they dug their way 40 feet horizontally under a restaurant called "Chicken Inn" to the bank itself. Next, they dragged in gas cylinders and a thermic lance to attack the four-feet-thick reinforced concrete floor of the strongroom. A thermic lance is a specialized cutter used industrially to cut through concrete.

The diggers had walkie-talkies and so did a lookout planted, with binoculars, on a nearby luxury house rooftop. It was on a little tete-a-tete between the gent on the roof and the burrowers that Rowlands beamed in with his sensitive receiver. It was the night of this past Sept. 11.

It took a little time for Rowlands to catch on. The first thing he heard was the exultant cry, in a decidedly Cockney accent: "We've got at least 200 grand!" The robbers had reached the vault.

Like a dutiful citizen, he telephoned the nearby police station in Marylebone Lane. His immediate impression of the reaction at the other end was that they believed him to be a hoaxer or a crank, but he eventually persuaded them to send an officer around to his home to hear for himself.

Rowlands urged that a General Post Office detector van should be called in at once to pinpoint the source of the robbers' conversations. The constable assured him this would be done immediately.

The gang's crosstalk made reference to drilling in the street, and there was also talk of a waiter in a nearby restaurant who kept peering through a window.

Rowlands felt these were two valuable clues which would help the police pinpoint the actual bank in which the raiders were so diligently at work. But the police did not seem to appreciate the importance of conversations the radio ham was taping.

Furious at their lack of concern, Rowlands phoned Scotland Yard, told them what he had heard over the radio, and said it was quite clear a robbery was in progress involving a lot of money and valuables.

Even though the Yard's reaction did indicate more interest than had been shown at Rowlands' local police station, their approach to the bank robbery was pedestrian in the extreme.

Two days later, on a Monday, the completed robbery was discovered at the Baker Street Branch of Lloyds Bank. In the angry official inquiry that followed, the big question was: What about the Post Office detector van that Rowlands had suggested?

The Post Office people insisted that the robbers stopped transmitting five minutes after the detecting equipment was brought into play.

"If we had been alerted sooner," said a spokesman, "we could have found the transmitter very quickly. Once in the area, we could have pinpointed the building in a matter of minutes."

The police reported that they had put ,in a call for the use of the detector van 10 hours earlier, but had been told it was not possible to contact the unit because it,was not on 24 hour duty. To which the Post Office replied that the police had not indicated there was any particular urgency. It did nothing to reasssure the owners of the robbed deposit boxes when Scotland Yard later issued a statement that they and the Post Office were tightening their emergency links. "We have established where the weaknesses were," said a spokesman. "We have learned lessons from this episode and it won't happen again."

As a certain onetime resident of Baker Street would undoubtedly have commented, were he around: "What can one expect? It's elementary, my dear Watson."

WITH THE FCC

Following is a reprint of an article in the Texas VHF-FM Society NEWS in which a summary of Prose Walker's comments at SAROC appeared. In the relaxed atmosphere of his visit, he was able to comment more explicitly on several issues of prime interest to hams. This article represents a superb review of current FCC thinking. It must be remembered that Mr. Walker stated his ideas in places, and that unless indicated, these items have not been placed into effect.

FCC AMATEUR CHIEF VISITS NORTH TEXAS

A. Prose Walker, W4BW, Chief of the Amateur and Citizen's Division of the FCC was a guest and featured speaker at the January 10th meeting of the Richardson Wireless Klub. Throughout his visit, Mr. Walker was constantly bombarded with questions about the probable outcome of the various rulemaking actions pending before the FCC. Mr. Walker was free and open with his answers, and lent considerable assurance that we are, indeed, represented by a ham's ham. He did preface his remarks with a caution that they be interpreted correctly and kept in context. That context is worth explanation.

As Chief of the Amateur and Citizen's Division, Mr. Walker directs and administers the preparation of the report and order which is the culmination of any rulemaking procedure. However (and this must be understood clearly), the initial report and order prepared by his division is not necessarily ever issued as it was written. After his division's work, the document must be analyzed by the FCC legal staff, by the Safety and Special Services Bureau, and finally by the seven commissioners. There are many opportunities for reversals in this approval path, and the final report and order may be substantially different when issued than when drafted. Mr. Walker's beliefs and findings, then, can be assumed to have a direct influence on the work done in his division, but cannot be assumed to carry promise about the final rules.

Mr. Walker thinks the report and order following docket 18803 (VHF Repeaters) might be issued before mid-year. It will probably be issued first, before the phone band expansion, "eye bank," and 220 MHz hobby band subjects are finished. In summary, it seems that VHF repeaters will be dealt with kindly and almost completely in accordance with our Society's comments. The extensive linking of repeaters for non-emergency use might not be permitted beyond a total of two, or at the most, three machines.

Mr. Walker believes that sub-band allocations as proposed by the FCC are not necessary beyond prescribing what portion of each band may be used for repeaters. He delivered an admonition that we hams coordinate immediately, effectively, and nationally to formulate a frequency coordination plan to obviate interference between repeaters and stations of other types, and among repeaters themselves. Such coordination would have to take into account the newly established amateur satellite service and other users of the spectrum. While not suggested by Mr. Walker, this subject seems to be of sufficient importance that it might well become a crusade within the ARRL.

The information required on license applications for repeaters may change to include those items directly related to establishing a service radius. Such items as height above average terrain, power output of the transmitter, transmission line loss, and horizontal and vertical pattern data may well be required on future applications. Conversely, the requirement to explain in detail the functioning of every relay and other system component probably will be eliminated.

Access by tone may be required, if for no other reason than to establish without doubt the using operator's intent to key a repeater. This possible requirement ties directly to the subject of unattended operation. The commission has apparently, regardless of Mr. Walker's disposition on the subject, not yet reached a decision about whether the prime responsibility for repeater operation lies with the trustee of the repeater or the licensee of the station using the repeater. Carrier-operated repeaters appear to be likely to be prohibited unless they are monitored and controlled full time. Tone-access repeaters, however, seem to be better candidates for unattended operation – although the subject is by no means resolved at this time.

Logging of transmissions will probably go, automatic identification of repeaters will stay (and in fact, a future requirement is being studied for fully automatic digital identification of all transmitters), in-band control probably will be allowed, and a technical log might be required. Rather than list each of the points made by each of the comments submitted to the commission, Mr. Walker indicated that we probably would be permitted each of the boons we sought – with the possible exception of unattended operation. He personally believes as we do that unattended operation should be allowed and readily cites the precedent established by the land mobile services in support of his beliefs. His ability to convince the commission, however, will be the determining influence in the outcome. Considering Mr. Walker's knowledge, experience, level of concern, and understanding of what ham radio is all about, coupled with his apparent deep interest in repeaters, it is difficult to be anything but optimistic at this point.

Mr. Walker touched on several other subjects outside the area of VHF repeaters. Some of the more significant items are reported here. There probably will be an expansion of the 75 and 40 meter phone bands. More space might be provided on 160 meters. Ten meters might support a small allocation for repeaters. The EIA petition for reallocation of part of the 220 MHz band for citizen's band operation hasn't been resolved. There is much pressure for its adoption, but there are serious potential problems in the areas of enforcement and the federal government's priority in the band for radio location services. Because the issue is so "up in the air" at the moment, Mr. Walker suggested that amateurs do nothing until or unless the FCC issues a notice of proposed rulemaking.

The commission is concerned about amateurs who run more than the legal kilowatt. It seemed that the FCC has just about run out of patience with the problem and is prepared to legislate a cure. One solution might limit the plate dissipation rating of vacuum tubes to a certain level. The best solution is to clean up our own ranks of the violators and scofflaws. The message was very clear. Another subject discussed in the same unpleasant vein was the apparent large number of frauds holding conditional and technician licenses. In six months of 1971, 134 licensees of various classes were called in for re-examination. 59% failed to show, 17% failed the test, 24% passed. Suspected perjury concerning qualifications prior to renewal time has attracted the commission's attention, and steps are being taken to reduce the number of violations.

The entire subject of call signs will shortly receive commission attention. The block of prefixes AA through AL have been assigned to the U.S. but have not been assigned in the amateur service as yet. Many possibilities exist, and the final outcome may be a long way off, but some examples of what might be done are: Extra class licensees might receive prefixes W/K/WA/WB, etc., with a one or two letter suffix. Advanced class might use part of the AA-AL block. Generals might get nothing but "1 X 3" calls. Novices "2 X 3" with WN or KN prefixes, and repeaters the same with WR or KR prefixes. The idea supports two considerations: the most obvious is the benefit to the monitoring service in determining the class of licensee; and a secondary benefit is the incentive attached to receiving a prestige call in the higher class license grades.

Two new grades of technician class licenses may be established in the future to replace the current technician class. They would be no-code licenses, but with two grades of technical competence indicated by names like "VHF general," or "VHF extra," just to cite an example. Repeater trustees would likely be of the higher grade only. Mr. Walker's discussion on this subject received enthusiastic support from his audience.

Mr. Walker's final point concerned the possibility of establishing more HF ham bands. Many countries are ceasing operation of their HF fixed stations in favor of cables and satellites which provide much higher reliability. The spectrum vacated by these services could be made available, in Mr. Walker's opinion, if we hams begin to work now at a professional and diplomatic level. The next World Administrative Radio Conference in 1977 will treat HF spectrum allocations, and it behooves us, he thinks, to get busy right away within the League making preparations. It is a serious and difficult subject which encompasses not only domestic but international effort of the highest professional quality, but it is not impossible. Mr. Walker tantalized the audience with visions of ham bands every 2 or 3 MHz throughout the entire HF spectrum!

PLEASE INCLUDE YOUR ZIP CODE WHEN YOU WRITE 73.

FCC REPORT

by Bill Grenfell W4GF

Reprinted from January 1971 Auto-Call. Re-reprinted from February, 1972 Ra Ra Rag.

The ARRL response to the Commission's Docket 19245 Notice of Inquiry has been filed and is, I think, quite revealing of an attitude which, unfortunately, does little to help the FCC resolve the problem.

Briefly, this concerns Section 97.39 of the rules which say amateur station licenses "will not be issued to a school, company, corporation, or other (non-amateur) organization, nor for its use . . . " Although it has been advising others of its belief that the rule prohibited amateurs from furnishing communications on behalf of non-amateur organizations for more than 14 years, the FCC's reply to a Lion's Club letter that the rule applied to the Eye Bank Net (which is sponsored by the Lions' organization) caused a big fuss and resulted in the writing of some rather heated and misleading editorials. See November 1971 QST, page 79 for the filing, my June 1971 Auto-Call report (page 5) and October 1970 QST editorial (page 9).

While Bob Booth's work in preparing the comments for ARRL is quite comprehensive and well documented, I believe it strays from the most productive direction and that some of the arguments presented weaken, rather than strengthen, the League's presentation. For example, the comment traces the controversial "nor for its use" phrase back to the amendment of the rule made by the FCC in 1938 as a result of the League's request "to close the loophole." It states that "the League most certainly would not have suggested the addition of the phrase "nor for their use" and "nor for its use" if there had been even the slightest indication that the phrase might even remotely be interpreted to restrict the message handling activities upon which the League has been built since 1914." League Secretary Warner's December 1928 QST editorial discussing the "nor for its use" phrase is cited. What the League's comment fails to recognize and deal with is that *the phrase has been interpreted to apply to communications* and therefore, if this is undesirable, the *only* way to prevent such an interpretation in the future is to change the rule. It should be recognized that early rule language and interpretations cannot remain unchanged when the communications and the people involved in station operation and in the regulatory process change as time marches on!

From my point of view as a former FCC employee of 20 years involved in this amateur regulatory process, I think I can reflect the Commission staff's point of view in observing that the reference to the Commission's "persisting in its misinterpretation of Section 97.39" is hardly going to win them over. I think the views of a majority of the Commissioners themselves is probably well represented by Chairman Burch's statement to the Washington Chapter of the QCWA last March. I recommend that you read it. (QST, May 1971, page 81)'

The Commission and staff has given the amateurs and their League every opportunity to participate in arriving at an agreeable solution. I hope the League will see its way to forget the past and provide positive help to the Commission.

Gf

FROM THE FILES OF THE FCC

Finds 'em, Catches 'em, Cancels 'em!

A U.S. District Court Jury found two Des Moines men guilty of violating FCC Rules governing the use of CB radios. Raymond W. Huxford, 55, was convicted of exceeding FCC limits on CB radio antenna height, power output, length of broadcast and of violating FCC Rules by operating on unauthorized frequencies, using an unauthorized call sign, relaying messages for persons other than himself or family, and sending messages as a hobby or diversion. Mr. Huxford was found guilty on six counts of violations of the Communications Act.

James O. Edmunds, 40, was convicted of exceeding FCC limits of length of broadcast, operating on unauthorized frequencies, using an unauthorized call sign and sending messages as a hobby or diversion. Mr. Edmunds was found guilty on four counts of violation of the Communications Act.

U.S. District Court Judge William Stuart continued bond at $2500 on each defendant and delayed sentencing pending pre-sentence investigation.

Refer to 73, December 1971, for more details.

The General Class license of W9LMR is under suspension for out of band operation. He was monitored while operating on 7004.6 kHz and was so notified of the violation. FCC rules require written replies to such notices. LMR did not reply to the first nor subsequent letters and hence the suspension. In other action, the Extra Class license of WB4DXX is under suspension for the remainder of its term for several violations. The first was communicating without identifying his station at proper intervals, and for transmitting signals for a purpose other than communication. Official notices of violation were sent on two occasions for these and no reply was made. On another date, the transmitter of the licensee was transmitting in "excess of its modulation capabilities for proper technical operation, resulting in excessive distortion and frequency instability." A notice was sent to WB4DXX and he replied explaining the circumstances. A third violation was committed on another date when he willfully interfered with other signals. The response to this notice claimed the interference was willful but not malicious, and the interference was due to negligence on his own part. In the FCC order, the findings are summarized in the statement, "That the licensee's actions described above are contrary to the public interest, convenience and necessity standard of Sections 301 and 307(a) of the Communications Act of 1934 . . . " It was ordered that the Extra Class license of WB4DXX be suspended for the remainder of the license term.

NOVICE
NOVICE
3725
BAND

There is such a variety of equipment available kit form and ready made *and* homebrew too that setting it up for total enjoyment should be emphasized. Your station has to be efficient and comfortable too. Some Novices (and higher class licenses) prefer to install their stations in cabinets or platforms that are above the operating desks. This looks well and it leaves the table top clear for logbooks, pencils, keys, and mikes. All the additional space under the rig can be used for storage and also for extra room if your operating desk is also used for a work bench. This presents a neat and orderly appearance that is impressive to visitors and also convenient to operate if controls do not have to be adjusted often.

Another arrangement is to tilt the front of your equipment so that it seems to face you as you look down at it. This eliminates the squinting and hunching down to read dials and meters. What's more, it looks like the gear is mounted on a professional work bench. Perhaps a short SWR bridge can be placed underneath to act as a support. This adds a nice touch as this otherwise empty space is filled with another knob or two and a meter.

(continued)

But is your desk set up for maximum operating convenience? Can you sit at the table comfortably for several hours and not get tired from eye strain, arm muscle fatigue, writer's cramp, or other afflictions of the ham? The first arrangement described above looks fine and as mentioned, as long as you do not frequently retune the transmitter or receiver, it is easy to use. Certainly there is adequate space to stretch your entire forearm on the table to make sending with a hand key easier, and there is sufficient room to work with scratch pad and log books. But can you sit there for a few hours staring straight ahead at eye level, staring at the dials? I would imagine that your back would hurt from sitting erect so long and alternating with leaning over while sending. And if you have to retune the receiver or transmitter frequently, as in a contest, your arm will have to be raised to turn the knobs and your shoulder will ache. If the rig is at a certain height, your elbow will bear the weight of the arm that it supports. Lowering the rig might help to relieve some of the physical pressures of operating over extended periods.

Raising the rig has its attendant problems too. If it is too high, the forearm will be supported by the muscles in the upper arm and a lot of weight will be balanced at the elbow. Your arm is like alever and if the load (the hand and forearm) is long and the opposite side of the lever is short (your upper arm is almost vertical as you sit at the table), muscles in the arm and shoulder will soon ache and the elbow hurts. Lowering the rig to a point where the forearm can rest on the operating desk and knobs can be turned with a thumb or a couple of fingers will help a lot in easier operation. This arrangement also offers the advantage of having the gear next to your hand as your arm and hand are relaxed.

Are you right or left- handed? Do you tune your receiver often? Is the main tuning knob close to the hand that can more comfortably turn the knob? Some receivers have the tuning knob close to the left side of the receiver and if you are right handed, you will have to reach across your body to operate it. By reaching across your chest, you constrict your chest and breathing becomes a little more difficult. It may not be too noticeable at first, but after an hour or two, you begin to feel a little fatigued from cramping your lungs and breathing muscles. If the desk is not too wide, put the less frequently used equipment above but not so close that rising heat causes problems with stability.

Loudspeaker and headphones should be within easy range, the speaker such that it does not send sound to only one ear, and the cans in a position that they can be quickly reached and plugged in. Paper, log, pencil all have their place too. Lighting should be not too strong or weak and preferably it should be indirect, that is, reflected off a wall or ceiling. Avoid glare.

Ham radio is an enjoyable hobby so do not make it physically hard to enjoy it. Station arrangement for convenience and comfort is an art. Think of how much each piece of gear will be used in comparison to each other piece. Are frequently used items handy or buried in a drawer? Taking the time to set up everything for comfort helps to enjoy the art of communication.

And do not place your station in front of a drafty window.

. . .K1NUN

REPEATER UPDATE

LISTENING
94 76 88 73 70 64 82. . .

CT	WA1NQP	Naugatuck	444.2–449.2
CT	WA1KGQ	Vernon	19–79
			52.76–52.525
			443.3–448.3
			221.38–224.38
IN	W9CSF	Michigan City	
	Incorrectly listed in Jan. as W9CF.		
	Recent changes are 1.8 kHz TB or 131.8 Hz PL		
MA	WA1KHB (formerly W1HWK)		
MA	WA1KHC (formerly W1CSF)		
MA	WAMHN	Somerville	07–67
MA	W1RJS	Salem	28–88
	(formerly W1ZAW Beverly)		
MA	W2EMB	Everett PL 88.5 Hz	13–73
MN	K0LAV	St. Paul W1.4	34–94
NJ	WA2ZVQ	Toms River	31–91
NY	K2LEQ	Delete	
OH	W8CQR	Cleveland	16–76
RI	W1HQV	Providence	16–76
TN	W4BS	Memphis	22–76
WI	W9VZR	Milwaukee T2.1	29.440–29.600

Navy MARS repeaters are linking on a coast-to-coast network. The latest information is that they are using input and output frequencies of 148.41–150.09; AF MARS uses 142.155–143.46; and Army MARS uses 143.35–148.01.

Tnx to K0LAV, W1HQV, K9DZE, K1KRY, K3ZQN, K4ZZO, W9BLR, W1GAN, W2EXQ.

When you hear a new repeater on the air, drop us a line and we'll share the news. If you hear of one going off the air, let us know also, please.

National 52 Simplex

The move toward using 52 as a national simplex frequency got support from the repeater groups of the Northeastern U.S. at the meeting of 75 repeater groups in Westchester (PA) and about 50 groups in Shrewsbury (MA) early this year. All agreed to the 52 transceive channel. Add this to the similar agreements in the midwest and you have a movement.

With the hope of encouraging this idea 73 wrote to the manufacturers of FM transceivers and asked that they consider including 52 pairs in their sets in the future instead of 94 pairs. Several manufacturers were enthusiastic about this and as present stocks of the 94 crystals get down to reasonable levels the new 52 pairs should start getting into service. Many manufacturers indicated that their customers have only to write to them and an exchange of crystals can be made at no charge.

To encourage the move to 52 simplex 73 will publish a box score for the next few months listing all sets which will be coming out with the 52 pair.

Why the big push for 52? This should take some of the pressure off the use of 94 as a simplex frequency. The 94 pairs of crystals in sets has resulted in heavy simplex use of this channel in the larger urban areas and this causes trouble with 34–94 repeaters. All you need to do in the New York area is hint at a new 34–94 machine and 94 will turn blue as the emotions pour out, obscuring reason from 88 up to 97 or so.

The fact remains that there are more 34–94 repeaters than any other and they are not going to be wished away by New York or Los Angeles or the other big urban areas.

With the cooperation of crystal companies and transceiver manufacturers the change to 52 can be made during the next few months. Inexpensive crystal pairs for 52 will help. Free exchange of crystals by manufacturers will help. Cooperation will help most of all. Does it really make sense to sound off endlessly about getting repeaters off 94? The view from Jackson Heights (NY) may tell you that just about everyone in the world is using 94 as a transceive frequency and everything would be just great if those crumbs over in New Jersey would just move that repeater in Greenbrook. A look at the repeater list in this issue will tell you the big story of the multiplicity of 34–94 repeaters around the country and the virtual impossibility of getting "all repeaters off 94." Perhaps 52 is the better bet.

Derrick Electronics in Broken Arrow OK will supply crystals for all the commonly available rigs for only $7.75 *per pair*. Converted commercial rigs are slightly more. Derrick is the first supplier to indicate this type of support for a national simplex frequency. Sonar Radio will supply any crystals to the users of their products as substitutes for 34–94 and 94–94.

NEVER SAY DIE

... de W2NSD/1

EDITORIAL BY WAYNE GREEN

OUR PROFILE

It should be no news to amateurs that CB groups have been stealing the thunder from us as far as public service is concerned. The communications provided by a group of CBers with mobile units is fine for most local area situations and in most parts of the country CB has been putting amateur radio to shame.

The size and expense of amateur radio equipment for the low bands has been such that interest in mobile operation has dropped tremendously over the last twenty years. In the old amplitude modulation days a little mobile converter and low powered transmitter weren't a big deal. The converter played through the car radio and worked fine. Then came sideband and a whole new ball game as far as stability and complexity was concerned. And out went wholesale mobile operation as we knew it in the early 50's.

Mobile operation is back, stronger than ever, but it is on two meter FM now and works through repeaters. We have better communications than we ever had before, so how about using it for public service? We can now talk base to mobile to hand unit over a range of about fifty miles from most repeaters, ideal coverage for most local applications.

Okay, we have the facility, how do we swing into gear with it? How can we make this pay off for amateur radio?

The number of events and situations which can use good communications is endless . . . it can be almost any sporting event such as boat races, bicycle races, ski races, cross-country races, car hill climbs, car rallies, parades, telethons, etc. All you have to do is keep your ears open and get the member of your repeater group to keep on watch for opportunities to serve.

Providing service is fun . . . a lot of fun. You'll be right in the middle of what's happening and you'll be working with the people who are running the event. You may find yourself parked in an out-of-the-way spot along with a small team of timers on a rally checkpoint. Your job will be to send the times of the cars passing through the checkpoint back to the rallymaster so he can compute the scores. You may well have to do this for two or three different checkpoints through the day if it is a long rally. The chances are that you'll emerge from this job with a strong interest in rallying.

Serving is fine, but please don't forget that the service is only half of the work. You may be self-effacing and not want to blow your own trumpet over what you've done, but amateur radio needs all the credit it can get so put your modesty aside and let the local papers know what you are going to do, what you are doing and what you have done. Also alert the local radio and television stations . . . get good PR for amateur radio. And . . . please . . . send a copy of the newspaper item to 73 when you get done so we can perhaps make a mention of it in our newspages . . . we send reprints of the better newspages to Congress.

HIGH POWER BASE STATIONS

Repeaters are designed to work with mobile stations running on the order of ten watts. Most of them will give coverage of about fifty miles or so under these conditions. So what happens when someone comes along with a home station running 250 watts plus a nice big beam which steps that up to about the same signal a 5000 watt mobile would put out? Chaos.

A big base station can lift repeaters for a couple of hundred miles around and put several out of business while making a local contact.

If you have a big signal base station please keep in mind that it is within your capability to ruin the fun for a lot of people when you are inconsiderate. Fellows will go along with you on an occasional band opening, particularly if it isn't at the peak operating hours, but don't be in there night after night wiping out repeaters in the next state just because you don't care. Fun is the name of the game . . . fun for as many people as possible. So don't spoil the fun.

PRIORITY INPUTS

One of the grumbles frequently aired by FMers who have come into ham radio via the two-way communications route is that too many base stations take up repeater time and don't let the lower powered mobile stations get a word in. Now and then there is a case where a real emergency comes up and long-winded higher powered ops just won't shut up long enough to let a breaker get through with emergency traffic.

Rather than go the route of freezing base stations out of repeaters, perhaps we might think of the situation in terms of needing more repeaters, not less activity on the ones we have. Until all of the two meter and even the 220 MHz repeater channels are full and active, we do have room for repeater expansion.

Emergencies and low powered mobile entry into repeaters can be solved by setting up a second receiver at the repeater site with a priority hookup so it will override the regular base station input channel. One reader has gone so far as to suggest that a "national" emergency calling channel be set up which would override all repeaters. We could set aside one channel for strictly emergency traffic input and have it take over all repeaters in range, but this would require an awful lot of cooperation on the part of the users to keep the hell off that channel except when the emergency arrives. Perhaps that is too much to ask.

COLLINS KAPUT?

Apparently no decision has yet been made by the Collins management about the future of the amateur radio division. Rumors are, of course persistent that Collins will close down their amateur radio manufacturing.

Collins, once leading the industry with new designs for amateur equipment, seems to have stopped their development about ten years ago at the time of the ARRL petition to the FCC which eventually resulted in the downgrading of most amateur licenses.

This is a far cry from the days when Collins had just brought out the 75A1 and the 32V1 and were busy selling the advantages of sideband to the Air Force. Old-timers will remember the many flights around the world made by Art Collins W0CXX with Mort Kahn W2KR and a handful of other "important" hams made in Air Force planes with Generals Butch Griswald and Curtis LeMay. These chaps talked with their small group of friends on the high end of 20m phone, continuing the "private club" type of ham radio so popular on the high end of 75m during the 30's.

Perhaps this is exaggerated in my mind, but I seem to recall that as part of the effort to sell the Air Force on Collins sideband equipment, their ham gear was installed in just about everything General LeMay had that moved or was around him . . . home, car, plane, boat . . . etc. However the sale was made, it seems to have worked and millions of dollars of Collins gear was bought by the Air Force, or was it billions?

Somehow, though the equipment is the oldest still being marketed for amateurs, Collins equipment still has prestige. It certainly was fine in its day. The cost of redesigning would be very high now and there seems little likelihood that the new Collins management, strapped for cash, would find it worthwhile to make the investment required to continue to sell in the static sideband ham equipment market. FM is the big one in 1972 and in that field Collins would be starting almost from scratch and would be up against those little transistor radio makers from Japan.

What will happen to used Collins prices if the factory closes down the dealer setup? This could have serious effects once parts and repairs are hard to come by.

Being practical about it, there seems little possibility that Collins will continue to make ham equipment. It is sad to see another top name in ham radio go.

* * *

Old-timers do not have any corner on the market when it comes to grumbling about how bad things are in the ham bands. The Nattering Nabobs of Negativism are souring away, bad-mouthing the inconsiderateness on twenty meters, the lids on six, the base stations who talk at length over repeaters, and so on and on and on.

Perhaps it is the old psychological mechanism known as projection that they are seeing. It is just possible that the reason they are complaining so bitterly is that they are faced with themselves at every turn and don't ever see anyone else. That's enough to turn any stomach.

Is there a pat answer to this? An easy solution?

I think so. The next time you get regaled with sighs and groans about what our bands are coming to, suggest (tactfully) that said griper try finding out a bit about the chaps that he talks with the most. He could make up a set of index cards or a file folder with notes on each regular contact . . . full name, wife's name, names of children, what all of them do, other hobbies of his and his family, places he has visited, what equipment he has and maybe what he is thinking of getting, notes on any interesting yarns he has told, what other ham interests he has, bands he works.

Such a file will serve several purposes. Getting the information will result in some of the most interesting contacts the other fellows have ever had . . . and they will comment on this. People like talking about themselves more than anything else in the world. Your curmudgeon will soon find that, once he knows more about the chaps he has been talking with, he will enjoy the contacts a lot more. They will be with people, not just call letters.

Can this system fail? Probably, but you'll have to prove it to me by trying it first.

73 TOUR OF EUROPE IN SEPTEMBER

How would you like to walk around Moscow with a transceiver and work a bunch of amateurs over there with you on a tour? Special permission has been requested to permit U.S. amateurs to visit Moscow this fall and bring along their two meter transceivers . . . plus permission for 73 to bring along a complete small repeater unit and set it up so we can all keep in touch from anywhere in town. Will that be fun?

The trip is scheduled to start September 4th from New York and fly first to Copenhagen . . . Tivoli amusement park will be open . . . some of the finest restaurants in the world . . . and REAL Danish pastry . . . or would you rather take a look at those sex shops? We'll arrange for you to meet Danish amateurs and visit with them . . . perhaps a nice hamfest and party. We expect no problems setting up a repeater here . . . nor with getting permission for all of us to operate.

The second stop will be Berlin, with organized tours (if you like) of both East and West Berlin. Other than this there will be no organized tours. You will be flown to a city, taken to a nice hotel, and provided with breakfast . . . from there you are on your own. We'll recommend restaurants . . . get you in touch with local amateurs . . . and give you the benefit of our experience.

The third stop will be Moscow where we will meet many of the local amateurs . . . and have a party with them. We hope to arrange it so those interested in working DX will be able to operate some of the club stations and talk back home.

The last stop will be Amsterdam . . . more amateurs . . . hopefully a party . . . and more two meter fun, probably with our own repeater.

The trip will last three weeks and will be something you will remember the rest of your life. Nothing like this has ever been done before . . . how about coming along?

In order to keep the price of the trip as reasonable as possible we will be staying at good hotels, but not posh ones. We have always found that the smaller hotels are much more friendly and fun . . . better food . . . better service . . . and an interest in you. You can have the snob places where the desk clerk has a permanent sneer.

The whole trip, based upon double occupancy of rooms, with bath wherever possible, including all air and land transportation, airport taxes, breakfasts, parties, is expected to run about $700 each . . . $1350 for two.

If you like the idea and want to reserve a spot on this trip you may send in a check for $200 down payment for each ticket. This is refundable in full up until 60 days before the trip and in part after that. Final payment will have to be 60 days before departure. Please sign up early so we will be able to handle the amateur radio license registrations and permits for the four countries. We'll send you crystal information for your transceivers to match our portable repeater as well as the many repeaters now on the air in Europe.

Three solid weeks with Wayne Green? Lordy!

. . .W2NSD/1

NEW PRODUCTS

NEW GE VARISTOR

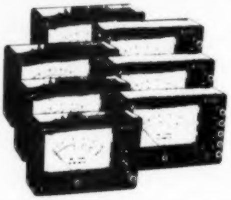
Voltage surges burning up your transistor projects? Need some kind of protection on an IC that is easily ruined by excessive voltage? The answer to the problem is the new GE-MOV varistor made by General Electric. By mounting this device in parallel with the delicate components or circuit the MOV acts as an insulator until a voltage surge occurs. Then the MOV becomes a conductor and the power is safely bypassed from your circuit. The MOV, short for metal oxide varistor, can be used for protection, stabilization, or regulating voltages to components like ICs that can melt with too much voltage. As technology advances, these devices will find greater acceptance in the homebrewer's shack, but in the meantime, they will be used in industrial applications such as TV, relay and motor protection, and other places where solid state controls are found. We'll be hearing more about this in the near future. Contact the *Semiconductor Products Dept., General Electric Co., Building 7, Mail-Drop #49, Electronics Park, Syracuse NY 13201.*

(continued on page 12)

NEW PRODUCTS

Continued from page 11

SINGLE FUNCTION METERS



Experimenters will really like the new single function meters made by ALCO. These meters have multiple ranges, but each is made for only one function (i.e., dc microamp, dc milliamp, dc amp, dc volt, ac milliamp, ac volt, and ac amp). Each meter has a wide face, making reading easier, and the accuracy rating is 1.5%. Low cost makes these easy to own, as the average price per meter is about thirty dollars. Write to *ALCO, 1551 Osgood St., North Andover MA 01845.*

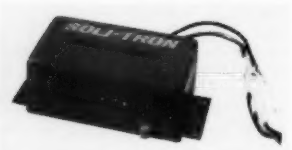
NEW 220 TRANSCEIVER

CLEGG 21er: the first 220 MHz FM transceiver offering the operating features and quality performance that FMers have come to expect on lower frequency bands.

The 21er provides automatic panel selection of ten primary crystal controlled transmit-receive channels and secondary continuous tuning of the 220 MHz FM band. The 21er provides a conservative ten watts output combined with a .25 μV receiver with the ruggedness and reliability of an extruded frame and diecast panel structure.

Scheduled for production in June, the 21er will be priced under $300. Also planned for early release are 220–144 MHz receiver converters and 220 MHz repeater package.

6–12 VOLT DC CONVERTER



Solitron Devices, Inc., announced the release of a 6–12V dc converter for use with vehicles having a 6V negative ground system. The converter will step up a 6V dc source to 12V dc for use with the newer electronic accessories now available for the higher voltages. The converter can be used to supply 12V dc for use in powering AM-FM radios, auto stereos, tape deck equipment, amateur communications equipment, and other accessories.

The converter also has 6 amp output – continuous, a switch and pilot light to insure converter is working, puts out up to 72W, has a one year warranty, and fits conveniently in trunk area or under dashboard of vehicle. For further information contact *Solitron Devices, Inc., 256 Oak Tree Road, Tappan NY 10983.*

LOW COST I.C. POWER SUPPLIES

Viking Electronics, Inc. has introduced a line of low cost power supplies for logic and linear system applications. Priced from $17 to $24 in single quantities, the OEM 70 Series provides typical outputs of 3.5 to 6V @ 3 amp, 8–15V @ 1.2 amp with regulation of .5 to .1% and ripple of 1 to 2MV dependent on models. Features include electronic current limiting, floating output, stable differential amplifier circuitry, silicon transistors and computer grade capacitors. For more information contact *VIKING ELECTRONICS, INC., 721 St. Croix, Hudson WI 54016.*

IMPROVED TEMPO FM AMPLIFIER

In January we reviewed the Tempo 100 watt amplifier . . . just in time to find that a new model had been released which was even better in almost every way!

The Tempo amplifiers are made by TPL Communications in Hawthorne, California, not in Japan like the Tempo FMV transceiver. They were formerly made by C.T. Power, but the company was reorganized and now is owned by Tom Litty K6RAD, a young designer from TRW, the company that makes most of the power transistors used in the power amplifiers on the market today.

The new 120 watt amplifier has printed circuit coils, with about the only things sticking up at all being small lumps for the driver transistor and the three parallel output transistors, some flat by-pass capacitors and small tuning capacitors. With 10 watts in you definitely do get 120 watts out – this is exactly what I measure in my car using the Standard 826M as a driver. It does make a difference too! With the ten watt signal I can generally lift repeaters that are coming in an S-4 or so – the 120 watts puts me through repeaters that are less than S-1, but still are readable.

If all of my contacts were made parked on the top of my nearby mountain, I wouldn't have much use for the higher power. But one of the problems of living in the mountains is that most of the time I am driving with a mountain between me and the repeater I am talking through. This is where the power helps a whole lot. After all, if I can hear the repeater, why shouldn't I use enough power to get into it from wherever I can hear it? That seems reasonable to me and the 120 watt Tempo does this job beautifully.

Tom has added some other extra to the new amplifier; little plus details. There is now a jack for plugging in a control switch to turn the amplifier on and off, keeping down your battery drain when the extra power output isn't really important. Once your repeater is coming in over S-6 or so you probably won't need the pair of shoes and your car may appreciate holding onto the 17 amperes.

Perhaps it's a small thing, but I appreciate the addition of a power output plug instead of a cable hanging out with a UHF connector on it. Once the unit is in place under the seat of my car it doesn't make any difference, but when I go to take the amplifier out for a trip (I take it with me when I fly and use it in rented cars), it greatly simplifies the change.

The TPL amplifiers were on display at SAROC and were one of the hits of the show! The wattmeter used for the demonstration showed that the amplifiers were rated conservatively and that 140 watts out of the 120 watter was not uncommon.

The promised 220 MHz TPL transceiver drew much attention too and is due to be produced soon. The company reorganization put them back a few weeks. There are, I understand, well over 200 back orders for this unit, so perhaps we will start seeing serious 220 activity in the near future. The most important product promised from TPL is a 220 MHz repeater. Once that is available we can start populating the band in earnest. I look forward to the day when virtually every repeater club has a 220 MHz repeater as well as one for two meters.

TPL has quite a wide range of amplifiers for two meters, six meters, 220 MHz and 450 MHz. Their two meter amplifiers are designed to work with any of the commercial transceivers, from the one watt output Drake TR-22 up to the 25 watt Gladding and Simpson units. They even have an amplifier that will lift the TR-22 to 100 watts out.

Distributors would do well to contact Henry about handling this line of equipment. W2NSD/1

SOCIAL EVENTS and CONTESTS

The Radio Association of Erie, on April 8, will hold its annual Ham Auction at the St. George's Gym. The auction starts at 2:00, and it is expected to be a good one. The gym is located 1½ miles north of I-90 on U.S. Route 19. Free map and details from RAE Auction, Box 844, Erie PA 16512.

* * *

The Southern Tier Radio Clubs are sponsoring their Thirteenth Annual Hamfest for April 15 at the St. John's Ukranian Hall, Johnson City NY at 2 P.M. For tickets and additional information, contact John Pike WA2UKS, 635 Lacey Dr., Endwell NY 13760.

* * *

The Delaware Amateur Radio Club will hold a Horse-Trader and Auction night at the County Engineering Bldg., Kirkwood Highway, Wilmington, Delaware on Wednesday April 12 at 8 P.M. Bring your gear and sell or swap. For further information contact Charles McGonigal WA3AVD, 18 Harvard Road, Wilmington DE 19808.

* * *

The Fresno Amateur Radio Club presents Fresno Hamfest '72 on April 28, 29 and 30. There will be swap tables, transmitter hunts, displays, banquets and more. The convention will be held at the Fresno Hilton. Listen in on 7255 WCARS and 3952 WPSS, or write to Fresno ARC, P.O. Box 783, Dept. HF, Fresno CA 93712 for more information.

* * *

The Rockaway ARC will hold its Annual Spring Auction and FMers Get Together Friday evening April 28, 1972 at 8:00 P.M. at the Hall of Science, 111th St. & 48th Ave., Carona, N.Y. at the old World Fair grounds. Doors open at 6:00 P.M. to accept items for the sale. Two dollar donation at the door will include refreshments. For further information contact Auction Chairman, Al Smith WA2TAQ, P.O. Box 341, Lynbrook, N.Y. 11563.

* * *

Southwest Ham Round-up and Fiasco will be sponsored by Old Pueblo Radio Club April 29–30, 1972. Headquarters Ramada Inn, Tucson AZ. Banquet, technical sessions with ham applications and demonstrations. Ladies, luncheons and tours. Pre-registration prize plus other prizes. Swapfest, auction, and other activities on the 30th. Plan to enjoy the hospitality and fun in the sun. Contact Al Summers W7MGF, Chairman, c/o O.P.R.C., Box 6497, Tucson, Arizona 85716.

* * *

The Young Ladies Radio Club of Los Angeles will hold its Sixth International YLRL Convention. Tours, cruises, talks, meetings, and entertainment will fill the long holiday weekend of May 26, 27 and 28. The convention will be held at the Edgewater Hyatt House on Pacific Coast Highway overlooking the Long Beah Marina. Registration of $12.50 goes to $14.00 after May 15. Further information can be obtained from the Convention Committee, P.O. Box 3092, Long Beach CA 90803.

* * *

The Fresno Amateur Radio Club presents Fresno Hamfest '72 on April 28, 29, and 30. There will be swap tables, transmitter hunts, displays, banquets and more. The convention will be held at the Fresno Hilton. Listen in on 7255 WCARS and 3952 WPSS, or write to Fresno ARC, P.O. Box 783, Dept. HF, Fresno CA 93712 for more information.

GEORGIA QSO PARTY

Starts: 2000 GMT, Sat., May 13, 1972.

Ends: 0200 GMT, Monday, May 15, 1972.

The eleventh annual Georgia WSO Party is sponsored by the Columbus Amateur Radio Club, Inc. There are no time or power restrictions and contacts may be made once on phone and once on CW on each band with the same station. Each complete contact counts 2 points. Georgia stations multiply their total QSO points by number of different states and Canadian provinces worked. DX stations may be worked for QSO points but do not count as multipliers. Out-of-state stations will use the number of Georgia counties worked for their multiplier (a possible total of 159).

Write to CARC, Inc., Attention: John T. Laney K4BAI, P.O. Box 421, Columbus GA 31902 for full information on the contest.

MARYLAND

Potomac Area Hamfest will be held at Westminster, Maryland, on Sunday, April 30th, 9:00 to 5:00 $2 registration covers flea market and tail-gate sales. Professional food and beverage catering on grounds. Parking for 400 cars. Usual hamfest activities. FM talk-in on 146.94. Details from K3LNZ, K4LHB or W3EVF.

1972 NEW YORK STATE QSO PARTY

This contest is open to all amateurs and SWL's in the world.

Times: 1700–0500 April 29 through April 30 GMT; 1200–2350 April 30 GMT.

Calls: In State: CQ NY TEST; out of State: CQ NY.

Exchange: QSO number, RS(T), QTH – out of state stations use ARRL sections; NY stations use counties.

Scoring: Score one point per contact on 80–10; two points for each 160, 6, or 2 meter contact; times number of multipliers.

Logs must contain date and time, band, mode, station worked, QSO number, QTH. First new contact for each multiplier numbered.

Certificates will be awarded to top scoring station in each ARRL section, country, and NY county. Special Novice and Technician certificates will also be given. Second and third place awards will be issued at the discretion of the contest committee.

Logs, comments, photos, etc. should be sent no later than June 1 to LERA ARC Contest Committee, Jeff Ronner WB2AEQ, 35 Gottlieb Drive, Pearl River NY 10965. Stations planning operation in NY are urged to contact LERA so they can plan for coverage of all counties.

THE FOURTH RTTY WAE DX CONTEST

RTTY WAEDC '72

The Deutscher Amateur Radio Club (DARC), the sponsor of the RTTY WAEDC, and the Deutsche Amateur Fernschreib Gruppe (DAFG), the manager of the RTTY WAEDC, have the honor to invite RTTY amateurs all over the world to participate in the 4th RTTY WAE DX Contest 1972. This contest is always held on the last weekend of April.

1. CONTEST PERIOD: April 29, 0000 GMT to April 30, 2400 GMT.
2. CONTEST CALL: CW WAE de . . .
3. SCORING: The final score is the total QSO points plus QTC points multiplied by the sum total countries from all bands.

Contact WAEDC officials for further information: *WAEDC - Committee, D-8950 Kaufbeuren, P.O. Box 262, Germany - West.*

COLUMBUS GEORGIA HAMFEST

The fourteenth annual Columbus, Georgia, hamfest will be held on April 9, 1972 at the Fine Arts Building behind the Municipal Auditorium at the Fairgrounds. For information, write J. T. Laney, K4VGI, 1905 Iris Drive, Columbus GA 31906.

(continued on page 14)

DX FOOTNOTES

According to the *Mobile News* the Journal of the Amateur Radio Mobile Society, the following members have attained new status in the Mobile Century Award Listings: W6KZL/m 236, F3DJ/m 221, G3BID/m 201, SM5RQ/m 190, DL6UH 160, W4NEW/m 140, G3TJY/m 121, WA3HDU/m 108, G3KNB/m 103, WA4WTK/m 102, and DJ3LF/m and WA2FQG/m, 101 apiece.

Gus reports in the DXers Magazine:

W3QLW has received the Arabian Knights certificate which states on a beautiful document, "The Arab Radio Amateur League has the pleasure to certify that Mr. Oscar G. Herrick, W3QLW, has contacted ten Arab countries and has been granted the Arab Knight award in significance of being a dear friend to all Arab Radio Amateurs. League Chairman (signed Hussein, JYL) Date 30 Sept. 1971 No. 27."

C31DP will be active for three weeks in June, so says Omer ON5TO who should know; it is his second call.

SOCIAL EVENTS & CONTESTS

(continued from page 13)

7th WORLD ORCHID CONFERENCE AMATEUR RADIO CONTEST

The contest has been organized by the "Liga Colombiana de Radioaficionados, (Zona 4a) and is sponsored by the 7th World Orchid Conference. It begins at 0000 GMT, Saturday, April 8, 1972 and ends at 2400 GMT, Sunday, April 9. AM and SSB in phone only. 5J4LR and 5K4LR will also be on the air. Multi-operator stations not allowed. Exchange: HK4 stations, RS plus a 3 figure number indicating the power of the station. Other stations, RS plus a 3 figure contact number, starting with 001.

Points: For stations not in North, Central or South America – contacts with HK4 stations, 5 points, contacts with 5J4LR or 5K4LR, 10 points. For stations in North, Central or South America – contacts with HK4 stations, 3 points, contacts with 5J4LR or 5K4LR, 5 points.

The same station may be worked on each band for multiplier credit.

Final score: the result of multiplying the total number of points by the number of bands worked.

Mailing deadline: June 9, 1972, to: LCRA, Seccional Medellin, Apartado aereo 51900, Medellin, Colombia, South America.

Between Ed, W8KGR, and Guy, TR8DG, the French Community Net is handled very well. The net meets on Mondays and Wednesdays at 1930Z on 21.390. Plans are to increase activity to four days per week operation and they want many check-ins.

If you are looking for TN8BK, try around 1400Z near 21,330 up. As a doctor, Bernard does not have too much time for operating.

Les, ZD9GA, has been active from Gough Island on 20 SSB. Most of his operating seems to be list type work. QSL via ZS2RM.

7X2BK has been heard on 20 SSB, around 14,236 about 2000Z. Listen carefully as he is using transceive and an indoor antenna.

Every Wednesday Robert, 9U5CR, holds skeds with his QSL manager Omer, ON5TO, at 1800Z on 14,280. He is QRV for others after they are finished.

Tapei is active now that BV2AB, Bob, is on the air. He is the first American to be licensed there in several years. Look for Bob 14,230 from 2300–0130Z. Sends QSLs via K4ASI.

Contact Mary, WA3HUP, if you need help in working CR3KD on Portuguese Guinea. They have skeds twice a week on 15 and 20.

Nauri Island, C21TL, can be found 14,200. This station will be on the air for about three years. FB8ZZ, on the other hand, will only be active for another month or two. FH8CG can be heard near 21,285 about 1700Z. And FM7AA is at 14,222 about 1240Z.

JX2HK has been worked on 14,038 about 2000Z. This is Jan Mayen Island.

* * *

From CARF, we learn that . . .

ONTARS – Ontario Amateur Radio Service has commenced operation on 3775 kHz. Hours of operation are from 7 AM to 6 PM E(D)ST, daily. This is a call-in net similar to ECARS on 40 with the prime object of providing two-way facilities during the daylight hours throughout Ontario. Congraulations go to the Radio Society of Ontario for sponsoring the net and to Bruce Carveth VE3BC, ONTARS net manager.

* * *

And from the West Coast DX Bulletin . . .

An international group claims to have established an away-from-it-all republican state on the desolate sea-washed Minerva Reefs in the Pacific about 450 miles south of Fiji. Fiji has been asked to recognize the state, established by the self-styled Ocean Life Research Foundation of New York and London. Two dredges are due to arrive at the reef in three weeks to begin reclaiming up to 400 acres of land on Minerva. Mark Oliver, a U.S. Citizen who said he is one of the three directors of the foundation, said in Suva their intention was initially to build a port and later a sea city as a haven for people who wanted to escape from crippling taxes, riots, crime and drug addicts. "We decided on Minerva after a worldwide search because research showed conclusively that the reefs do not belong to anyone," he said. "By International Law one can claim by annexation only land above the sea that can be built upon. We have met this requirement by constructing two small islands of coral and sand on the reefs." Oliver said the Ocean Life Research Foundation, established 18 months ago and backed by scholars throughout the world, was serious about a sea city republic at Minerva. International engineering companies had been consulted and expenditures on the project, so far, totaled $180,000, he added.

* * *

QSLs for 3D6AO, Swaziland, may be sent to P.O. Box 1, Mhlume Tshaneni, N.E. Swaziland.

Nigerian Amateur Radio Service and Joe, 5N2AAJ only accept incoming QSL cards for Togo, 5VZ and TJ and they are not responsible in any way for outgoing QSL cards. All incoming cards are passed on to 5VZ immediately and after that their responsibility is ended.

The Liberian Radio Amateur Association sponsors a West Africa Net on 7060 at 0800Z each Sunday. So far 9G1, E12, 9L1, and 5V7 have joined in.

* * *

Some of the current active "DX-pedition of the month" stations: HP1IE/3F1IE, JW1EE, KF4SJ, PJ7VL, VA2UN, VK9JK, VK9XX, VK9XK, VP8JV, VS6DO, VS6DR, and 9Y4VT.

* * *

MCAS IWAKUNI, Japan, Oct. 5 — Captain James W. Jackson is a quiet man, but his voice has been heard all over the world. The 32-year-old native of Rochester, N.Y., operates KA5JJ, the only authorized amateur radio station here. Captain Jack-

LETTERS

I read with interest your editorial in Jan. 72 issue of 73. I fully agree with you that the amateurs made a big mistake by operating their repeaters with only .6 MHz spacing. The problems encountered at 1 MHz is a fraction of problems and cost involved with cavities and duplexers.

Let's not get ourselves into the same fix when we go fully duplex. The phone company operates mobile duplex with a frequency spread of 5.26 MHz in the 150 MHz range. It is possible to make mobile duplexers extremely small to fit right inside the mobile. "Systcoms" duplexer measures only 4 x 3 x 1½ in. for telephone applications. The two meter hand has a 4 MHz spread so why not use 3.5 mHz spacing and 220 has a 5 MHz spread so why not use 4 MHz spacing. Someone may come up with the argument that the spread is too great if you want to operate simplex also. The answer is the mobile manufacturers are learning how to broadband amplifiers so operating a transmitter over a 1 MHz range is possible. Recently I evaluated an IC-20 and found that the transmit power dropped only about 15% with two channels separated by 3 MHz. Let's get on duplex the right way. The same desensing and noise problems we are having now with repeaters will occur if we operate mobile duplex with a close spacing.

Some frequency coordination is required now before it is too late.

Vern Epp
Nelson BC

Other opinions on input and output spacing are invited. If we had it to do all over again, would we do it this way? Let's plan 220 and 450 with the wisdom of past learning.

son, assigned to Marine Wing Headquarters Squadron (MWHS)-1, 1st Marine Aircraft Wing, explained that KA5JJ is operated with equipment on temporary loan from MCAS Special Services, and some home-made items. The station, officially named an Auxiliary Military Radio Station (AMRS), broadcasts international Morse code. Although it has voice capability, Capt. Jackson chooses not to use it.

Permission to operate aboard MCAS Iwakuni was granted by the commander of U.S. Forces in Japan, through the commander U.S. Naval Forces Japan, and the commanding officer of MCAS. It was granted on the basis of Capt. Jackson's advanced class operator and station licenses, issued by the U.S. Federal Communications Commission.

Twenty years and nearly $6,000 have gone into a station he owns in the U.S., from which he broadcasts both voice and code to such countries as Russia, China, Chile, France, Sweden, and many others. Jackson moves the equipment with him when he is transferred within the U.S.

"Language is not that much of a problem," he states. "Most amateurs throughout the world know how to give their call sign, location, name and other important information in English."

Capt. Jackson is credited with helping to set up the MARS network in the Republic of Vietnam. While he was there, he conducted classes on amatuer radio operation.

RACES FREQUENCIES

In regard to your editorial concerning repeater frequencies, I feel you are on the right track. Something else you might consider would be to match these channel frequencies with the authorized RACES frequencies. We can hope never to be confined to these frequencies, but this could help improve the status of amateur radio. Also, it could conceivably make available some ideal repeater sights.

Keep up the good work.

Van. A. Sears WA4SQS
Columbia SC

How do other people feel about synchronizing standard repeater channels with RACES frequencies? There is a lot to be said on both sides.

CORRECTIONS AND AMPLIFICATIONS

Modified Heathkit HW-16 CW Xcvr page 101, Feb. 1972 – caption under Fig. 1 should be under Fig. 5 and vice versa. Also caption under 2 should be under Fig. 4 and vice versa.

John Edgerton WA3PRV
New Castle DE

Re - CKT Page 98 (Feb. 73 Mag) - "Variable Power Supply" by W4IOI. Please note - 100K pot - if set to minimum, shorts out basic 320V supply. "Come on guys, you can do btr than that."

Cliff Whipple W5VRT
Morgan City LA

No we can't.

REVISED MORSE

Some years ago a musical genius developed and patented a piano keyboard with a system of tiered tabs that was the acme of simplicity. No black notes for the fingers to slip off of, fingering was standardized regardless of what key the pianist was playing it.

It doesn't require much thought to figure out why this invention is gathering dust in the files of the patent office, and I venture to say that a revised Morse code, patented or not, would suffer the same fate for the same reason.

Harry Sorensen W7IH
Friday Harbor WA

HELP WANTED

I am a student anthropologist taking an anthropological look at ham radio for my Senior thesis. My goal is to provide the public (both college and community) insight into the people who make ham radio what it is – the hams. I need your help.

Here is your chance to sound off. Just write me a letter and tell me about your hobby – ham radio. You can tell me things like what you like to do best within ham radio (DXing, phone, CW, nets, etc.), what you think the ideal ham should be like, what you think of your fellow hams. Tell me about your equipment. If you're a phone man, how do you feel about CW, SSB, AM, or if you're a DX'er how you feel about AM, etc. What do you think of the ARRL? The FCC? How long have you been in ham radio? Do you buy gear or make it? What are your favorite bands? Do you belong to a net . . . club . . . which ones? What do you think of CB'ers? Just tell me about anthing you can think of that you'd like to talk about on the subject of ham radio.

I assure you that (1) I am a genuine anthropologist doing bona fide research with the approval of the ARRL, and (2) your names will be held in the strictest confidence and (3) I'm not some salesman or kook trying to get your names for a mail order firm. In fact, you don't need to sign your name or give me your address; just be sure that if you write that you state whether you're a ham and what license you have. This is very important for my data.

With your cooperation I hope to confirm some of the generalizations that I have made in my research. In fact, I may even have to confirm that no one great generalization can be made about hams! With your information I hope to get an overall picture of the people that are ham radio.

Thank you very much for your time and attention.

David Silver WN1PLC
Box 545, Troy NH 03465

Send your comments to David Silver, Franklin Pierce College, Box 885, Rindge, NH 03461.

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

HALLICRAFTERS SX-115 Receiver, Johnson 275w Matchbox/Swr, Johnson TR switch, Knight T150, PH Linear LA400c. Bud Johnson K1HGK, 48 New Searles Rd., Nashua, N.H. 03060.

GREATER BALTIMORE HAMBOREE. Sunday April 9 at 10 A.M. Calvert Hall College, Goucher Blvd. and LaSalle Road, Towson, Maryland 21204. (1 mile south of Exit 28 Beltway-Interstate 695) Food Service, Prizes, Flea Market, $1.50 Admission, NO TABLE CHARGE OR PERCENTAGE.

BUY OR BORROW for copy Tech. Manual for Corps of Engineers, 5kw. Engine Generator Unit, Hollingsworth Model EA-536, Stock List No. SNL 17-4780. 525–25. Will pay premium. W5BOY, 365 W. Saxet Drive, Corpus Christi, Texas 78408.

WANTED – Bird Model 43 wattmeter elements: 100–250 MHz one 5 watt and two 25 watt, 200–500 MHz one 10 watt. State condition and price. Technical Editor, 73 Magazine, Peterborough NH 03458.

WANTED – Tektronix Model 53/54C or Model CA or M scope plug-in. State condition and price. Technical Editor, 73 Magazine, Peterborough NH 03458.

TECH MANUALS – $6.50 each: R-388/URR, R-389/URR, R-220/URR, SP-600JX, URM-25D, BC-639A, TS-497B/URR, TS-34A/AP, OS-8E/U, BC-348JNQ, BC-779B, CV-591A/URR, LM-21, R-274/FRR. S. Consalvo, 4905 Roanne Drive, Washington, DC 20021.

WANT CLEAN COLLINS 51J-4, also Drake C-4; with manuals and original shipping containers. No junk! First letter give each serial number, condition, price; also price for both, if have both. Watson, 700 West Willow Street, Long Beach, CA. 90806.

GONSET COMM. IV 6M. "factory closeouts" with P.T.T. mike, AC, DC cords. Last ones Gonset will make. Only $169.00. Communications World, Inc., 4788 State Road, Cleveland, Ohio 44109.

SWAN 260 XCVR WITH MIC, ac/dc supply, mobile ant, mobile mount 4btv vertical, 15mtr beam $350 (603) 524-0716.

FOR SALE: Galaxy Station GT550 with accessories SC550, AC400, CAL-25, F3 CW filter, VOX35C. $450.00. Fine condition. John Ivanisko, 5 Clover St., Yonkers, N.Y. 10703.

EVANSVILLE, Indiana HAMFEST 4H Grounds (Highway 41 North 3 miles) Sunday, May 7, 1972; air conditioned, auction, overnight camping, ladies' bingo, reserved flea market booths. Advance Registration. For flyer, contact Morton Silverman W9GJ, 1121 Bonnie View Drive, Evansville, Ind. 47715.

ROCHESTER, N.Y. is again Hamfest, VHF meet and flea market headquarters for the largest event in the northeast, May 13th. Write WNY Hamfest, Box 1388, Rochester, N.Y. 14603.

HAMFEST-WABASH COUNTY Amateur Radio Club's Fourth Annual Hamfest Sunday, May 21. Rain or shine. Admission is still only $1. Flea Market – no setup charge, tech. talks, bingo for XYL's, and much more. For more information write to Bob Mitting, 663 N. Spring St., Wabash, Indiana 46992.

MOULTRIE AMATEUR RADIO KLUB, 11th annual Hamfest, Wyman Park, Sullivan, Illinois – April 30, 1972, Indoor-outdoor market. Ticket donation $1.00 in advance – $1.50 at the gate. Open 8:30 A.M. W9BIL 146.94mhz. M.A.R.K. Inc., P.O. Box 327, Mattoon, Illinois 61938.

21ST ANNUAL DAYTON Hamvention will be held on April 22, 1972 at Wamplers Dayton Hara Arena. Technical sessions, Exhibits, Hidden Transmitter hunt, Flea market and special program for the XYL. For information write Dayton Hamvention, Dept. S, Box 44, Dayton, Ohio 45401.

2-METER FM INOUE IC-10, Brand New, 1 & 10 watts, solid state, 12 channel, w/Etals, w/accessories, $235.00, Bob Brunkow 206-747-8421, 15112 S.E. 44th Bellevue, Washington 98006.

FCC "TESTS–ANSWERS" ... Original exam manual for First and Second Class License. –plus– "Self-Study Ability Test." Proven! $9.95. Satisfaction Guaranteed. Command, Box 26348-S, San Francisco 94126.

WARREN ARA'S FAMOUS HAMFEST, now family style, Aug. 20, Yankee Lake, Ohio. Gigantic flea market, swimming, picnicking, playground, all free. Camping available. Details: QSL W8VTD.

WANTED Motorola T1020A frequency/deviation meter – state age, condition and price. Technical Editor, 73 Magazine, Peterborough, N.H. 03458.

RUN SAWS, DRILLS, LIGHTS and many other items from 12v to 120v Auto Electric Power Converter. Hook to your car or truck alternator. Has 2 outlets and voltmeter. All instructions. 3¼ x 8 x 2½ metal case. Send $14.95 plus $1.00 handling to: Phil Bowers Associates, 71 Beechwoods, Wakarusa, Ind. 46573.

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EXHIBITORS – Reserve space now for ARRL Hudson Division Convention, Oct. 21–22, Tarrytown, N.Y. Contact Hank Frankel, WB2DQP, Box 535, Bellmore, N.Y., 11711. Phone 212 394-5257.

ALUMINUM ANTENNA MASTS, 9½' long x 3" dia., x 3¼" dia. at base (sleeve 6" long over end). Painted green. 20 lbs. Unused. Very heavy duty. Can be telescoped with short insert. Ideal for Field Day. Pickup preferred. $9.75 each. K3MNJ, 8361 Langdon St., Phila., Pa. 19152. Tel: 215-RA5-2373.

NEED OLD ISSUES or copies of A.T.V. Experimenters, A5 Magazine or any magazines on A.T.V. State price 1st letter. Gerald Cromer K4NHN, 1014 Summerland Dr., Cayce, S. C. 29033.

14AVQ VERTICAL, nearly new – $25.00; Hornet 3 element tribander with manual, fair condition, recently dismantled – $25.00; both $40.00 – ,WA4TST, 507 Pinecone, Waycross, Ga., 31501.

FOR SALE: Back issues 73. 1962, 1963, 1964, 1965, 1966 and later. Send SASE for list. Ray Helmick, 1423 Spring, Parkersburg, WV 26101

HEATH SB-200, extra set of finals $190 or trade for 2mtr FM mobile. Swan 240, AC power $70. Will ship. R. Lloyd, 705 B Whiting Ave., Albany, Ga. 31701.

Jack Townsend W4RIZ
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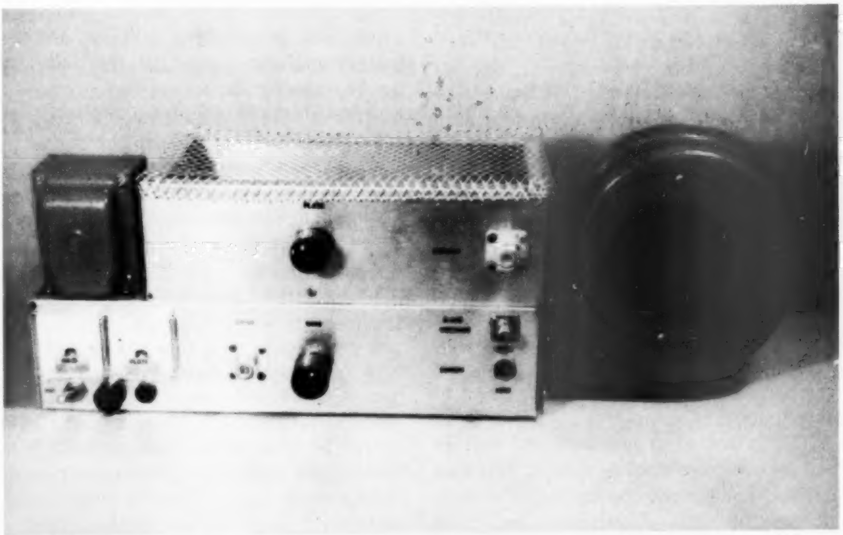
Power Amplifiers for Two Meter FM

A simple and compact power amplifier to boost transceiver output

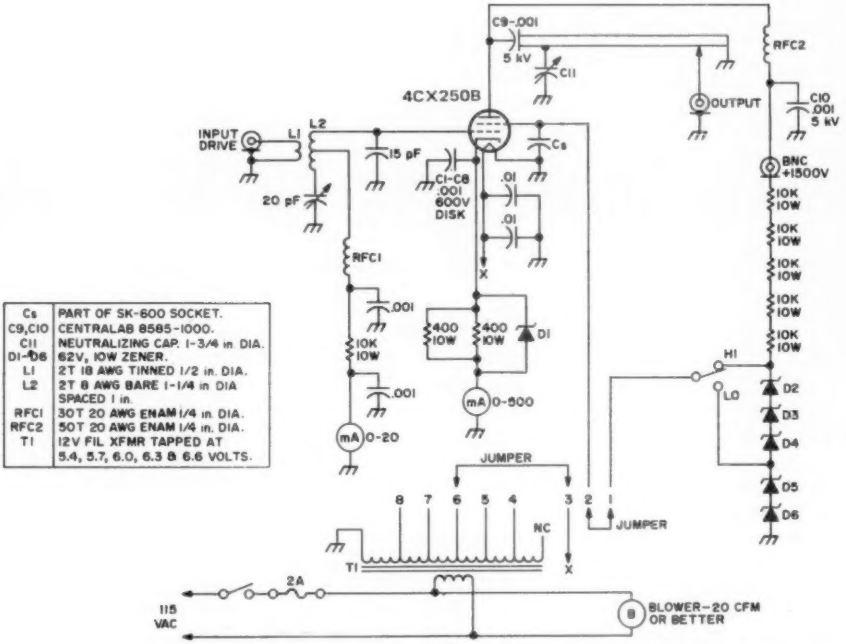
With the increased popularity of 2m FM has come an increased need for additional power to boost the range of surplus FM transceivers. This amplifier is designed for such service and operates with only 5W of drive to produce outputs in the order of 200W.

Simplicity is the keynote in the design and construction. It uses no silver plate, no neutralization, no bias supply, no screen supply, no grid loading, no plate loading capacitor, and suffers no damage if drive is lost. In addition, there is no necessity for protection of the tube in case plate voltage is lost since screen and plate voltages are provided from a common supply.

The amplifier derives all operating voltages from the plate supply and plate potentials may be used ranging from 750 to 1600. The most efficient operation, however, lies in the region between 1300 and 1600. Screen voltage is dropped from the plate voltage by five resistors totaling 50 kΩ. Five zener diodes stabilize the screen voltage and do not allow it to exceed 310V. Any combination of zeners may be used. The 62V 10W zeners used here were chosen because of their avail-



Grid input is at lower left, plate output at upper right. BNC connector at lower right connects to plate supply, switch on right changes screen voltage. Filament transformer on left is tapped to allow adjustment of filament voltage.


C9-.001
5 kV
C11
RFC2
4CX250B
OUTPUT
C10
.001
5 kV
INPUT
DRIVE
L1
L2
15 pF
Cs
20 pF
C1-C8
.001
600V
DISK
.01
.01
BNC
+1500V
10K
10W
RFC1
X
.001
10K
10W
400
10W
400
10W
D1
H1
LO
D2
D3
D4
D5
D6
.001
mA 0-500
mA 0-20
JUMPER
8 7 6 5 4 3 2 1
NC
JUMPER
T1
X
2A
115
VAC
B
BLOWER—20 CFM
OR BETTER

Cs	PART OF SK-600 SOCKET.
C9,C10	CENTRALAB 8585-1000.
C11	NEUTRALIZING CAP. 1-3/4 in. DIA.
D1-D6	62V, 10W ZENER.
L1	2T 18 AWG TINNED 1/2 in. DIA.
L2	2T 8 AWG BARE 1-1/4 in DIA SPACED 1 in.
RFC1	30T 20 AWG ENAM 1/4 in. DIA.
RFC2	50T 20 AWG ENAM 1/4 in. DIA.
T1	12V FIL XFMR TAPPED AT 5.4, 5.7, 6.0, 6.3 & 6.6 VOLTS.

Fig. 1. Schematic of high-power rf amplifier. C_1–C_8 – 600V Disk; C_9, C_{10} – Centralab 8585-1000; C_s – part of SK-600 socket; C_{11} – neutralizing capacitor 1¾ in. diameter; D_1–D_6 – 62V 10W zener.

ability on surplus at two for a dollar (Delta Electronics, Lynn, Mass.).

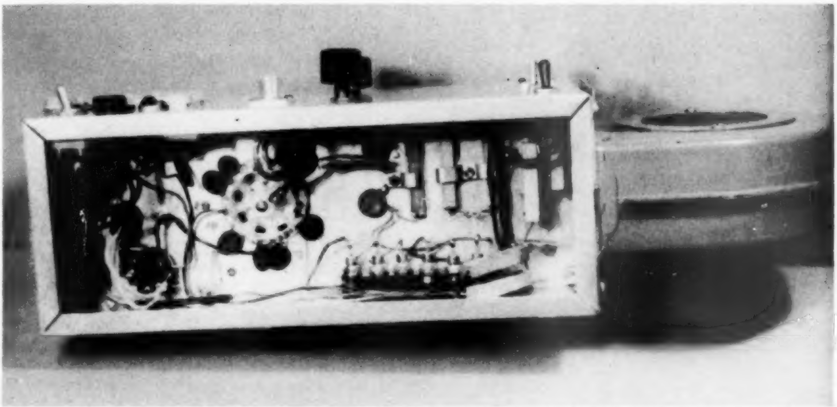
A single-pole double-throw switch changes screen voltage from 310 to 124V, allowing reduced input for tuneup or local work. Those interested in a greater range of power control may install a four-position rotary switch to tap into the zener string at each junction. All dropping resistors and zeners are located below the chassis directly in the air stream from the blower.

If zeners are not available, two VR-150 gaseous regulator tubes may be used, but the chassis will have to be made larger to accommodate the sockets.

If it is desired to monitor screen voltage and current, an octal socket is mounted behind the filament transformer. The jumper may be removed from pins 1 and 2 and a milliammeter inserted to check screen current during operation. If screen voltage readings are desired, the jumper is left in place and a voltmeter clipped to the jumper and to ground. If there is any doubt regarding the screen dissipation, it is suggested that the manufacturer's specifications be consulted.

Because of this system of deriving screen voltage, an external screen supply is not needed. The price paid for this benefit is the use of zeners and dropping resistors, but mounting them under the chassis tucks them away neatly and the blower keeps them cool.

Control grid bias is supplied by the drive in a conventional manner and protective bias is developed across a 200Ω cathode resistor shunted by another 62V 10W zener. In this manner the cathode bias protects the tube and provides a minimum voltage at all times, while the zener clamps an upper limit of 62V on the bias, allowing the tube to handle more power at high current. A zener may be used in the cathode lead without the resistors, but it



Bottom view of amplifier with cover removed. Zener regulators on copper heatsink area are at lower right, screeen dropping resistors, bias and'cathode resistors at upper right located in air stream of blower for better cooling.

operates too close to maximum ratings for good design.

Manufacturers recomend a screen voltage of 250V on the screen of the 4CX250 while this dropping network places 310V on the screen instead. When calculating screen dissipation be sure to take into consideration the fact that the cathode is at 62V above ground, making the actual screen voltage 250 with respect to the cathode.

Filament voltage is provided by a 12V 5A transformer tapped on five consecutive turns. Specifications call for 6.0V on the filament of the tube and it may be desired to adjust this voltage to compensate for variations in line voltage and tube aging.

To tap into the windings, remove the shell and outer layers of insulation, exposing the heavy turns of the secondary windings. Plug the transformer primary into 115V and measure the voltage on each exposed turn by clipping an ac voltmeter to a razor blade and gently pressing it into the enamel insulation of each turn. The turns to be located are those which show a potential of 5.4, 5.7, 6.0, 6.3, and 6.6V. Most transformers are wound for three turns per volt, so these turns will lie side by side.

Tap into each of these turns with a flexible lead which will later be brought out of the transformer. Pry each turn away from the body of the transformer with the point of a small screwdriver. Cut the wire and solder a small loop of bus wire to the ends and solder the flexible lead to the terminal thus formed. Insulate the loop with a strip of cardboard before pressing back into place. A coating of corona dope or shellac completes the job.

The five new wires are brought out of the transformer to the octal socket behind the filament transformer and terminated on pins 4, 5, 6, 7, and 8. Pin 3 feeds the filament current to the tube, so a jumper from this pin to the appropriate pin provides the proper voltage to the tube. It also allows the operator to monitor the filament voltage when desired by clipping an

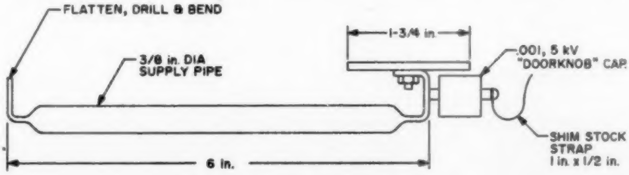
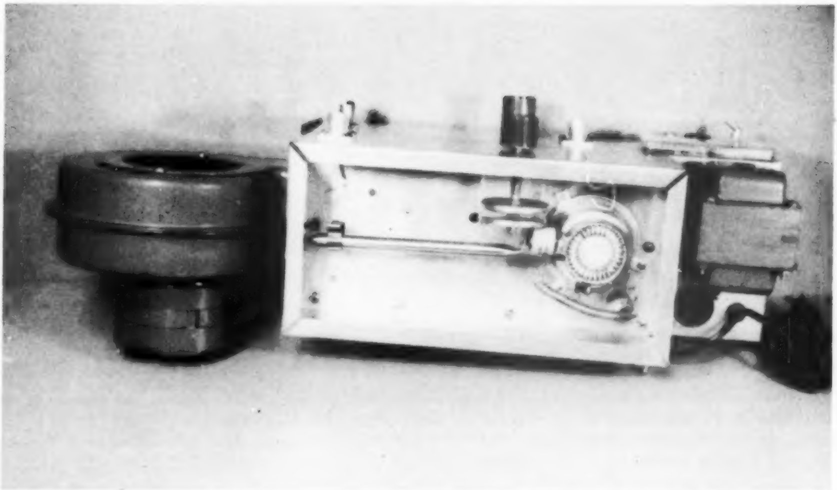


Fig. 2. Detail of plate inductor.



Top view of amplifier showing plate assembly and sliding tap on left. Tuning capacitor is neutralizing type made by National. Below filament transformer on right octal socket allows adjustment of filament voltage and metering of screen current.

ac voltmeter from ground to the jumper. Monitoring filament voltage on the 4CX250 is normally difficult due to the closed and pressurized grid compartment.

The plate circuit is quite simple and is capable of efficiencies of better than 60%. The plate inductor is formed from a length of "supply line," a chrome-plated brass tube used by plumbers, available at hardware stores for about 75¢. The ends are flattened and formed as shown into a 6 in. length. The cold end is fastened to the chassis while the other end is attached to the plate coupling capacitor and the stator of the plate tuning capacitor. The other terminal of the coupling capacitor is

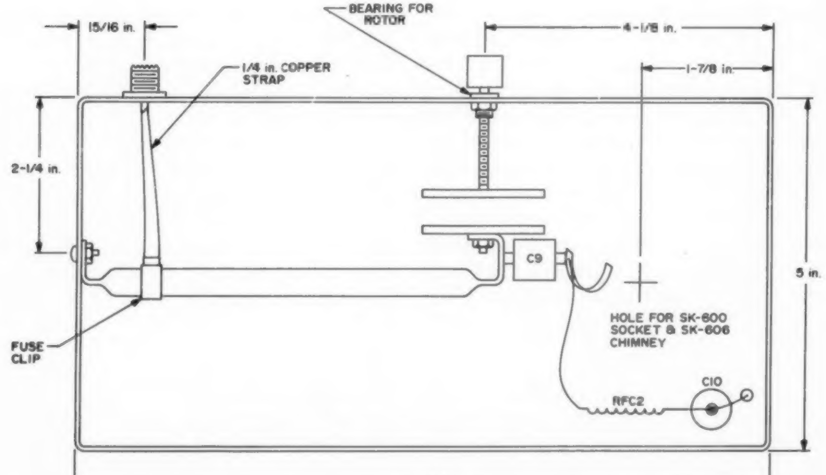
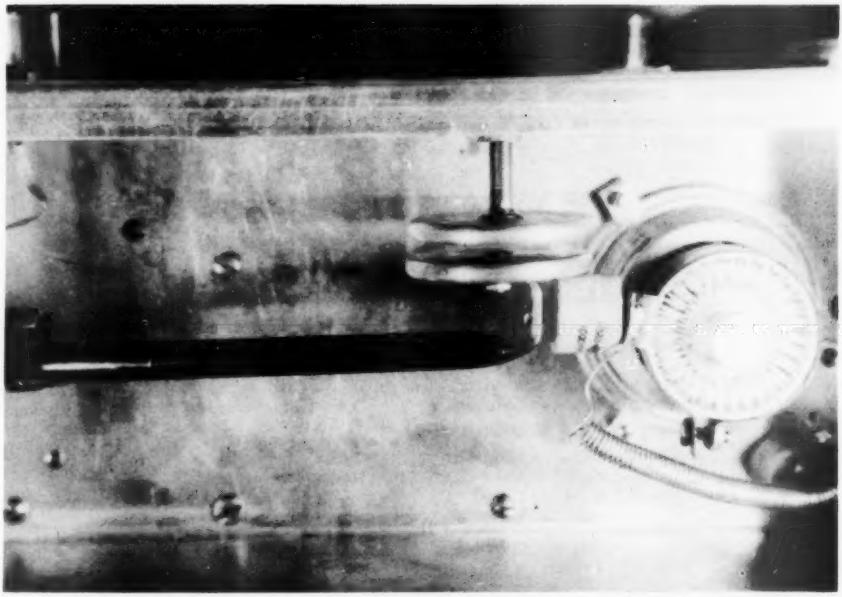

BEARING FOR ROTOR
15/16 in.
4-1/8 in.
1/4 in. COPPER STRAP
1-7/8 in.
2-1/4 in.
C9
5 in.
HOLE FOR SK-600 SOCKET & SK-606 CHIMNEY
FUSE CLIP
C10
RFC2
10 in.

Fig. 3. Detail of chassis.



Tube and plate assembly showing coupling capacitor and bypass at lower right. Coupling capacitor is held to tube by a copper collar and short strip of brass shim stock. Plate line is a length of chrome plated supply pipe.

screwed to a small strip of shim stock which is clamped under a copper collar encircling the tube. The copper collar is held in place with a brass machine screw.

The plate tuning capacitor is made from a National neutralizing capacitor with plates 1¾ in. diameter; the movable plate is supported by the original bracket bolted to the front panel. The shaft extends through the panel far enough to accommodate a plastic knob. Place a small compression spring and a washer between the knob and the panel to spring-load the capacitor, since vibration would otherwise cause it to creep.

If a neutralizing capacitor is not available, one can be made from disks of copper or brass soldered to a 0.25 in. brass machine bolt. In this case the shaft will work into a brass or copper plate screwed to the front panel. Again, don't forget the compression spring.

The only store-bought components in the plate structure are the two high-voltage, high-frequency capacitors (Centralab 858S-1000) used for coupling and bypassing and the tube socket and chimney (Eimac SK-600 and SK-606). The chimney is necessary to force air through the plate efficiently.

The plate choke is formed of 50 turns of 20-gage tinned solid hookup wire with the insulation removed, wound around a 0.25 in. stove bolt. When the bolt is removed the turns will hold proper spacing and can be wired directly into the circuit.

The loading assembly consists of a brass fuse clip chosen to fit snugly on the plate inductor, to which is soldered a copper strip 0.25 in. wide and long enough to reach the output connector. Loading is accomplished by sliding the clip on the plate inductor.

The amplifier is constructed on two chassis, the lower one 5 x 13 x 13 and the upper 5 x 3 x 10 (Bud AC-404 and AC-422) fitted with an aluminum plate on the bottom and a perforated aluminum plate on top to permit air to escape. The two chassis are bolted together with eight brass screws and the tube socket hole cut through both at once. It will not be

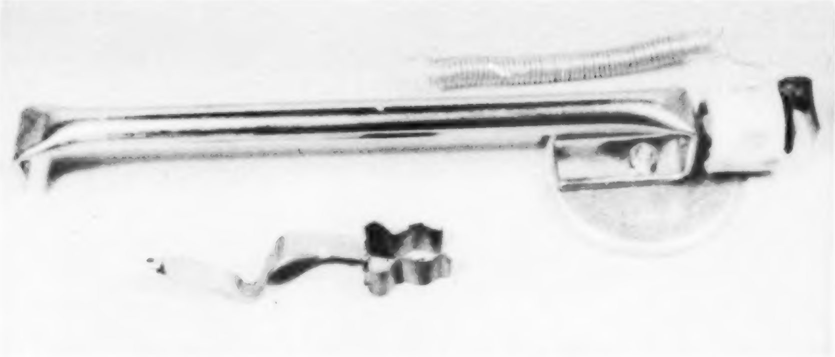
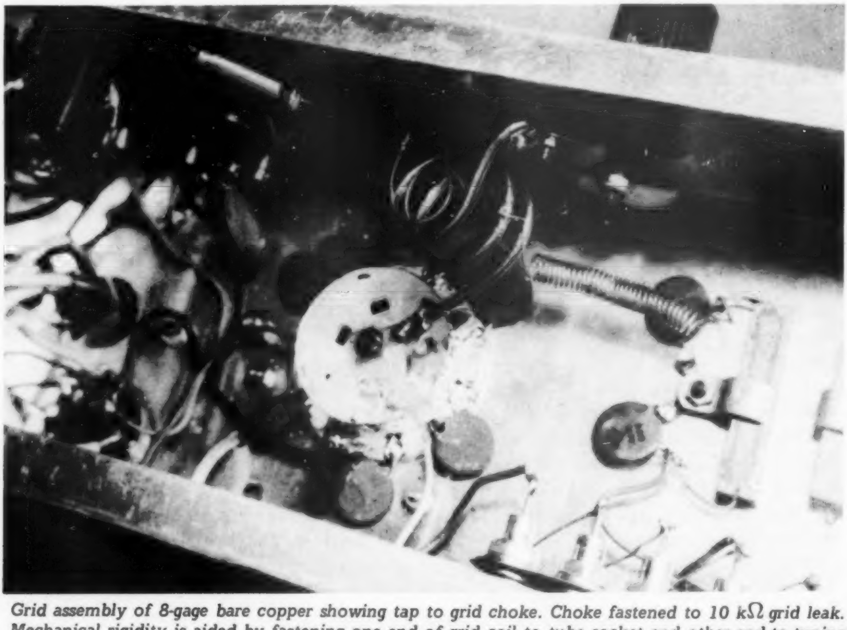


Plate assembly and stator of tuning capacitor. Plate choke is wound from 20-gage bare hookup wire. Brass fuse clip below slides on plate line to adjust loading. Quarter inch copper strap connects fuse clip to output connector.

necessary to make the grid compartment air-tight if the large blower is used. The blower provides enough air for both components and tube. In order to assure sufficient flow some small holes should be left in the lower chassis. Leave the holes open in the corners of the chassis as octal socket and at the filament transformer with putty or plastic tape.

Parts placement is not critical. Keep components in the lower compartment away from the grid coil which is supported by the tube socket on one end and the grid tuning capacitor on the other. The grid



Grid assembly of 8-gage bare copper showing tap to grid choke. Choke fastened to 10 kΩ grid leak. Mechanical rigidity is aided by fastening one end of grid coil to tube socket and other end to tuning capacitor. Zener regulators are partially visible in lower right.

plate choke, but with only 30 turns. It is necessary to use dissimilar chokes to avoid possible oscillation at the resonant frequency of the chokes. Bypassing of the cathode is accomplished by soldering in two disk capacitors at each of the four cathode terminals. It is not necessary to bypass the screen since this is done inside the socket itself.

Plate-voltage connections are made through a BNC connector. These connectors seem small and subject to arc-over but in practice operate well up to 2000V and are readily available on surplus. A jumper of RG-58/U coaxial cable equipped with male BNC connectors may be used from the amplifer to the power supply. This also provides a ground connection along with the high-voltage connection for greater safety. Even with this method, an added precaution would be to run another ground from amplifier to power supply separate from the one above.

To place the amplifier in operation put both top and bottom covers in place and energize filament and blower. Connect a wattmeter and dummy load to the output connector and a low-power 2m transceiver to the grid connector. Activate the transceiver and tune the grid to resonance indicated by a reading of 5–20 mA on the grid meter. At the same time the cathode current will indicate since the same current flows through this meter but the indication will be small.

If the drive is satisfactory, place the screen switch on "low" and apply plate voltage. Plate current will rise to about 60 mA. Tune plate for maximum indication on wattmeter. Some mechanical adjustment may be necessary between the rotor and stator of the plate capacitor. Loosen the collar around the tube and shift the position of the shim strip to place the stator in a better position relative to the rotor. Form the habit of always turning off plate voltage before removing the top cover.

If the plate tunes as it should, adjust the loading clip by inserting a tuning wand through the perforations and shifting its position until an optimum position is found which produces maximum output. Retune the plate after each change. In the amplifier pictured the optimum position was found to be 0.75 in. from the cold end.

At this point you should, with about 1600V on the plate, see about 40W on the wattmeter. Change the screen from low to high and retune the plate. It may be necessary to shift the loading clip slightly on high power. Plate current should now stand at 180 to 220 mA and output power should increase to about 200W. Turn off the amplifier and replace the dummy load with the antenna, again optimizing the tuning. The tube runs warm under these conditions and if a hand is held over the tube hot air may be felt exhausting from the tube.

To calculate plate input and efficiency, allowances must be made for the cathode bias. If 1600V is used on the plate, the actual plate voltage will be 1540. If 200 mA is indicated on the plate meter, grid bias must be deducted. 10 mA grid current would have to be deducted from the 200 to give a plate current and screen current (combined) of 190 mA. If measured screen current of 20 mA is deducted from the 190 mA, then the actual plate current is 170 mA. Thus, the adjusted plate current must be multiplied by the adjusted plate voltage to arrive at the actual input power of the tube.

If trouble is encountered at any step, check wiring, components (even new components are sometimes defective), solder joints, and the tube. It would be wise to obtain a used 4CX250 or 4X150A for tuneup purposes. Many FM and TV transmitters retire these tubes when emission drops. It would be better to use an old one for tuneup after which a good tube can be substituted for full power.

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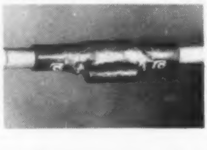

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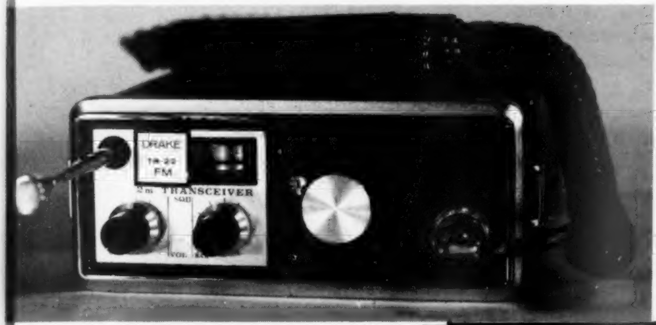

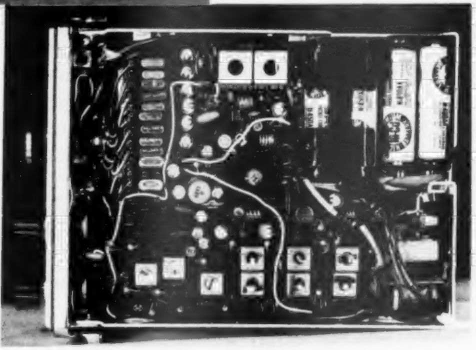

DRAKE TR-22

DRAKE TR-22

Of all the FM units available to the ham today the Drake TR-22 is unquestionably the most versatile and is an exceptional buy. If you are just getting started in FM and are looking around for a really universal rig the TR-22 is the one that will work on base mobile or portable with nothing else needed other than the possible exception of a mobile or base antenna (if you're more than 25 miles from your nearest repeater). This little gem is the result of Drake getting it all together, and what a package it is, too. Here is a 6 channel unit that you can sling over your shoulder that has state of the art circuitry, a little slim hand mike with retractable cord, internal rechargeable batteries, with built in charger and an internal telescoping antenna.

Coming back from SAROC on a United flight we asked the captain if we could use the TR-22 in flight. Not only did he give us permission but he had us moved from tourist up to first class so we wouldn't be right over a wing that might mess up our radiation pattern. Having those 6 channels on the little portable unit was a real joy, for as we left Las Vegas we said our goodbyes on 94 simplex and then switched to one of the local repeater channels. We talked the repeater out a hundred miles or so and then went back to 94 for a while. As we approached Denver we started hearing their 34/94 machine so we switched over to them. After a few QSO's we went the 28/88 route for some more. Upon arriving back at Boston's Logan airport it was even possible to hit the 73 repeater on 19/79 on top of Pack Monadnock Mountain some 70 miles distant. Admittedly our repeater is 2,000 feet in the air but 70 miles is still quite a haul with a watt and a half!

Before going out to SAROC we had crystaled the TR-22 up for the trip and with the popout case of the TR-22 it was a very simple matter to change the crystals around as they are all on top of the board right out in the open. Strapping is very easy, too, as each crystal has a terminal post right by it and jumpers go right in where they are needed. The transmitter warp trimmer capacitors are right by the transmit crystals and the receiver does not need any warp capacitors. Changing crystals is very easy because to get the TR-22 out of the case you don't even need a screwdriver. All you do is pull out the two little snap releases on the bottom of the case and the unit slides right out.

Using the TR-22 mobile is a snap as you only have to plug in the external dc power cord (so you save your ni-cads for portable operation) and plug in your mobile antenna. The little unit is so small that you can easily slip it into the glove compartment. Thus the chance of theft is greatly reduced. It takes only seconds to unplug the dc power cord and mobile antenna so you can take it with you if you don't want to leave it in the car. At this point you just pull up the internal telescoping quarter wave whip and you are working as a portable.

It is interesting to note that the TR-22 comes with a complete set of ni-cad batteries as part of the unit – not another accessory that you have to purchase. The same is true for the built in battery charger – it's all inside the unit with nothing else to buy. When you are at home just plug in the ac line cord and the batteries get recharged overnight. If you want to monitor at home or work the boys a little bit, the battery charger gives just enough current to operate the receiver so it doesn't pull your ni-cads down. Of course when you are listening with the ac plugged in, the ni-cads do not get charged until you cut the power switch off. If you transmit while you're at home then that additional current comes out of your ni-cad batteries. To check the condition of the batteries just turn the squelch control all the way counterclockwise and the S/ rf output meter gives you a battery voltage reading. This same little meter automatically works like an "S" meter on receive, so you can find a 'hot spot' if you're having trouble getting into the repeater. On transmit the little meter gives you a relative rf output indication so you know that you are getting out and also gives you some indication of how your batteries are doing under a heavy load. When your output power starts to fall off too much, a quick battery check will reveal that the batteries need a charge. The ac power cord or any of the external power or antenna cords can be plugged right into the bottom of the TR-22, even when it is in its carrying case.

The Drake TR-22 is a very rugged trouble-free unit. Recently when the 73 repeater (19/79) pooped out up on top of Pack Monadnock and there was quite a bit of snow on the access road, we slung the little TR-22 over our shoulder before mounting the snowmobile in zero degree weather. While going up the mountain we got a little carried away and hit an ice ridge and a big wipe-out occurred. After sailing off the snowmobile I landed spread-eagled right on top of the TR-22! Picked myself up and checked back in with K1NUN with no problem at all. After finally getting up on top of the mountain we worked in unheated buildings for a couple of hours and all the while using the little rig. With this kind of use that our TR-22 gets, it has got to built like the proverbial brick house. The TR-22 has proved so reliable that Drake has had very little warranty work to do and as a result has held the $195 price even though the U.S. dollar has been devalued by almost 20% in Japan.

Drake rates the TR-22 transmitter at 1 watt (conservative) but we keep measuring 1.5 to 1.6 on the Bird Termline in our lab. The receiver is rated at less than 0.5 μV but actual testing shows very near 0.3 μV. The receiver is double conversion with an FET rf stage and a ceramic filter in the 455 kHz stage. The first i-f frequency is the standard 10.7 MHz. IC's are used for the second i-f limiter and also for the af output. The TR-22 utilizes all solid state switching (no relays) for maximum reliability. The instruction manual for the TR-22 is very complete and easy to understand. It contains all of the operating instructions, labeled schematics with voltage charts for all transistors and IC's, complete pc board pictorials that are also labeled, and complete crystal data.

The Drake TR-22 is a fantastic little piece of gear and one of the most versatile units we have ever seen with so many normally optional features built in as standard features. Its performance is as amazing as its low price. It is truly a universal rig.

...W4FQM/1

John J. Schultz W2EEY
1829 Cornelia Street
Brooklyn NY 11227

AN AUTO-BANDWIDTH SELECTOR UNIT

This experimental unit attempts to set the bandwidth of a receiver automatically in accordance with QRM conditions. Although described as an outboard unit, the circuit switching arrangements described can also be wired internally in many receivers.

Many commercial receivers and even some transceivers have provisions for the independent switch selection of various i-f bandwidths for reception purposes regardless of the transmission mode (AM, CW, SSB, etc.) switch setting. Generally, most operators like to use a wide bandwidth when a band is not crowded, because of the tuning ease involved, and then switch to a narrower bandwidth as QRM conditions develop. It would be very handy, however, to have the receiver automatically switch to an i-f bandwidth appropriate to the QRM conditions. Such operation would be particularly desirable, for instance, when one is working a station and using a wide bandwidth and then suddenly a strong QRM signal appears. Usually, before one can readjust the receiver, some portion of the transmission will be lost.

This article describes an outboard receiver accessory unit which was developed to provide automatic bandwidth selection. The unit is complete in itself and makes an ideal accessory unit that can be added to a receiver or transceiver that does not have selectable i-f bandwidths. In the case of units which already do have selectable i-f bandwidths, the switching circuits used can be adapted in most cases to work with the installed i-f filters. The unit provides for two automatically selected bandwidths (which can be chosen for either phone or CW service), although the basic scheme can be expanded to include a greater number of bandwidth positions. A manual override switch is provided for manual selection of either bandwidth position.

Basic Operation

Figure 1 shows a block diagram of the basic stages involved in the selector unit. The filter stage is placed between the i-f stages in a receiver. It is controlled, through the other stages shown, by the level of the i-f signal preceding the filter stage. The amplifier stage boosts the i-f pickoff signal and then the output of this stage is rectified to provide a dc control voltage. The dc control voltage in turn operates a Schmitt trigger stage which operates a diode switch for bandwidth selection. The i-f pickoff is taken after the first i-f stage and not directly after the last mixer stage, so the unit will not respond to signals greatly outside of the normal i-f bandpass. The pickoff could be taken after the filter stage, but this will not provide as sensitive a response with receivers having good avc/agc action, since signals passing through the

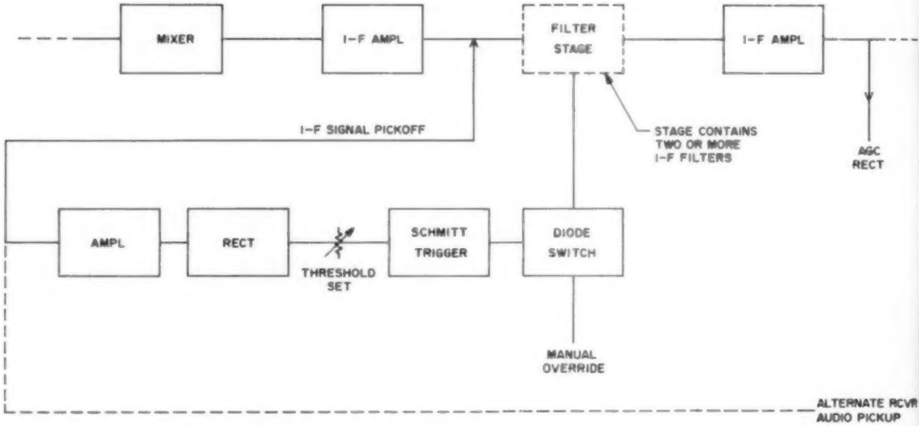

Fig. 1. Basic block diagram of the auto-bandwidth unit. Filter stage is inserted between i-f stages in a receiver. Diode switch as activated by level of i-f signal causes different i-f filters to be used.

filter stage will control agc action. However, the unit can be used in this manner and the control pickup signal can even be the audio output signal.

The unit operates simply on the basis that any i-f signal of sufficient amplitude which exceeds a preset threshold value will cause the diode switch to be activated and switch in the narrower of the filters in the filter stage. One can devise more elaborate triggering schemes where a stage samples and integrates the signal levels in the i-f passband to determine when the QRM level has reached a level requiring a narrower i-f filter, but the circuit complexity involved produces little in the way of better performance. Some provision has to be made so the unit will not be activated by extremely short, high-energy signals appearing in the i-f bandpass – such as a noise pulse – and yet not immediately reset the filter stage to a broader bandwidth after an energizing signal has set it to a narrow bandwidth. If the latter is not done, the unit would tend to follow a high-level CW QRM signal and keep switching the filter stage in accordance with the keying. The necessary discrimination against single pulses and the necessary time delay in filter switching is accomplished by a careful choice of the components in the rectifier stage and by the action of the Schmitt trigger stage. It is in the selection of these components and the action of the Schmitt trigger stage which mainly makes the unit described different from a simple VOX unit where such a unit is activated by receiver instead of transmitter audio and the VOX relay controls the selection of two different i-f filters. However, one can, by experimenting with the circuit time constants, adapt many VOX units for use as receiver audio-activated automatic i-f bandwidth selectors.

Practical Circuit

Figure 2 shows the actual circuit of the selector unit. Discrete transistor stages could be utilized but the use of the readily available and inexpensive Fairchild μL 914s simplifies the circuitry and is actually less expensive than using all discrete components. The first μL 914 unit serves as an amplifier stage and has a frequency response that extends from the low audio frequencies to about 1 MHz. The stage, therefore, does not have to be modified whether the pickoff point to trigger the selector unit is taken at some point in the i-f chain of a receiver or at the audio output of the receiver.

The second μL 914 units is wired as a Schmitt trigger. Normally, the output (terminal 6) of this stage is at nearly ground potential. When about 1.5V input is applied (terminal 1), the output rises to almost the supply voltage potential (+4.5V). The output remains at this level until the input voltage drops to around 1.1V, at which time

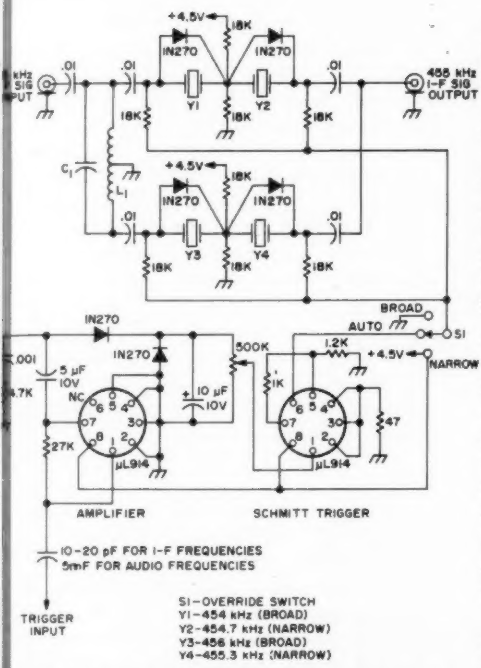
+4.5V
18K
IN270
IN270
.01
.01
.01
455 kHz
I-F SIG
OUTPUT
18K
Y1
18K
Y2
18K
C1
L1
+4.5V
18K
IN270
IN270
.01
.01
18K
Y3
18K
Y4
18K
BROAD
AUTO
S1
NARROW
IN270
IN270
500K
1.2K
+4.5V
.001
5 µF
10V
4.7K
NC
6 5 4
7 3
8 1 2
µL914
10 µF
10V
27K
1K
6 5 4
7 3
8 1 2
µL914
47
AMPLIFIER
SCHMITT TRIGGER
10-20 pF FOR I-F FREQUENCIES
5mF FOR AUDIO FREQUENCIES
TRIGGER
INPUT
S1-OVERRIDE SWITCH
Y1-454 kHz (BROAD)
Y2-454.7 kHz (NARROW)
Y3-456 kHz (BROAD)
Y4-455.3 kHz (NARROW)

Fig. 2. Circuit diagram of the auto-bandwidth unit. The trigger input can be af or an i-f frequency up to about 1 MHz. C_1 L_1 are chosen to resonate at the i-f frequency being used. Crystal frequency spacing is chosen on basis of bandwidth desired.

the output again returns to about ground potential. This "hold" action on the part of the Schmitt trigger, plus the characteristics of the rectifier circuit between the two µL 914 units gives the unit the delay characteristics previously described as necessary. The output of the Schmitt trigger drives a diode switch arrangement across a crystal filter circuit. Although the diode arrangement tends to make the circuit look somewhat confusing, the crystal filter circuit is a completely standard two-crystal circuit. The circuit is centered on an i-f of 455 kHz. The 454 kHz and 456 kHz crystals provide a bandwidth of about 2 kHz, while the 454.7 and 455.3 kHz crystals provide a bandwidth of about 600 Hz. Any other bandwidth can be chosen by proper spacing of the crystal frequencies, as well as any other i-f by choosing L and C to resonate at the i-f. When the output of the Schmitt trigger is at ground potential, the diodes across the 454.7 and 455.3 kHz crystals are forward-biased, and these crystals are effectively short-circuited. The diodes across the "broad" bandwidth crystals are back-biased and these crystals control the i-f bandwidth.

When the Schmitt trigger is active, the opposite condition takes place. The output of the trigger stage causes the diodes across the "broad" bandwidth crystals to be forward-biased and those across the "narrow" bandwidth crystals to be back-biased. The switching action is very fast and noiseless. Assuming that an existing i-f strip has sufficient reserve gain to compensate for the loss in the crystal filter circuit, as most receiver i-f strips will, the circuit of Fig. 2 can be used to build an outboard accessory unit for use with almost any receiver or transceiver. In those cases where a receiver already has built in several i-f filters which it is desired to utilize, the circuit of Fig. 2 can still be used and the diode switching arrangement shown applied to the built-in filters.

If the diode switching scheme is not easily adapted to the filters, the µL 914 Schmitt trigger stage can be used to drive a switching transistor which in turn activates a relay to switch the i-f filters, as shown in Fig. 3. The basic scheme shown can be expanded to several more stages of progressive selectivity by using more Schmitt trigger stages, each with a separate threshold control to trigger in turn as the output level of the first µL 914 amplifier stage increases.

Construction and Adjustment

The unit can be assembled either as an outboard accessory unit, or internally in a

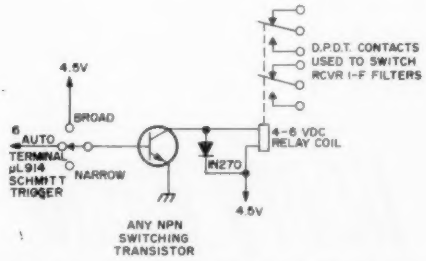
D.P.D.T. CONTACTS
USED TO SWITCH
RCVR I-F FILTERS
4.5V
BROAD
6
AUTO
TERMINAL
µL914
SCHMITT
TRIGGER
NARROW
IN270
4-6 VDC
RELAY COIL
4.5V
ANY NPN
SWITCHING
TRANSISTOR

Fig. 3. Instead of using diode switching and an external crystal filter, the two µL 914 stages of Fig. 2 can be used to control a relay for switching the interal i-f filters in a receiver.

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MA-490 49' Magna Mast *(With wall bracket, flat base & 8' mast)*	$324.95
MARB-40 Rotorbase *(Rotor not included)*	$204.95
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receiver. The latter type of placement is most convenient when utilizing the i-f filters built into a receiver. There is nothing critical about the construction of the unit except the usual precautions of lead dress, etc., appropriate to the i-f being used. The threshold control has to be available as a panel control since it requires manual adjustment depending upon band conditions and depending upon the setting of the rf and/or i-f gain controls in a receiver (also depending upon the af gain control setting if the receiver audio output is used to trigger the unit). With some practice, the threshold control can be set so that the unit is activated when the QRM level just exceeds that of a signal being copied.

Results

Several experiments were tried using the unit of Fig. 2 for CW reception with a 455 kHz i-f receiver. Triggering the unit from the first i-f stage output in the manner shown in Fig. 1 produced the best results. However, audio triggering was also quite effective as long as the agc circuit in the receiver was disabled. The main value of the unit was in moderate to heavy QRM situations, where very strong signals were apt to suddenly appear while a relatively weak station was being copied.

The use of the unit did not completely guarantee continued reception of the weaker signal because of other factors being involved such as receiver overload, agc capture, etc. However, the unit reacted to the WRM situation almost instantaneously as compared to the time required to manually readjust the i-f selectivity. Some further refinement of the unit is certainly indicated. The constant readjustment of the threshold control might be eliminated by linking the "base" level for this control with the level on the bias line in the receiver as controlled by the rf gain control. Nonetheless, the unit did demonstrate the real advantage of an auto-bandwidth feature for use in receivers under today's heavy and suddenly changing QRM conditions. With some added refinements, such a unit should prove to be as useful as such accepted receiver features as avc/agc, automatic noise limiters, etc.

. . .W2EEY

Eric Falkof K1NUN/1
Assistant Editor
73 Magazine

"Break"

" . . . so I told him where to get off the expressway and I guess he's all right now, Steve. Well, it's getting late, about 11:30, so I guess I'll knock off and go to bed. Been good talkin' to you. WB1ABC, this is W1XYZ." ssshhhkchunk

"Right, Bill. That guy'll be OK as long as he doesn't go too fast. It's a bit slippery out there and driving is kind of poor. I got in only a little while ago and it seemed like it was going to get colder and freeze up all of this snow that's lying all over the place. When you come right down to it, it's really not too good out there at all, but as I say, if he takes it easy, he'll be OK. Say, before you go, can you tell me what's going to happen at the meeting Friday? Break." shshshk "Break"shshkchunk

"OK, stand by, breaker. Steve, the meeting is going to be held at Les's house instead of at Mike and Laura's like it was planned. Seems like their little daughter caught the flu. We're gonna see a slide show about the new repeater down in, oh, what's the name of that city in Rhode Island? You know what I mean, Steve? Break." shshshsk "Break"shshsshkchunk

"Breaker stand by please. Yeah, it's in the Bay area. I forget the city you mean, but I know what you're talking about. Go." shsh"Br –

"Right. Didn't want to let the tail drop. No sense wearing out the relay. Well, the pictures will be about that new machine they're setting up. It should be a good one. Say, I'm bringing my wife. Why don't you bring yours? All the gals can head off to the kitchen while we take in the show. They never want to see any of this radio stuff. What say?" shshs"Break"shshskchunk

"OK. Just a minute, breaker. Good idea, Bill. I'll let her know what's happening. I know she'll want to see the others. Hey, here's an idea. Why not have all the wives bring a little home brew something. Since Les and the missus are being caught by surprise, we all can help out with the goodies." shshsshsh –

"That's a good one. I'll tell the little woman." shshsh –

"First thing tomorrow morning I'll get in touch with Joe and Mel and have them each call a few of the guys and we can get the wives working on this right off. We can make a real party out of this. I'll even volunteer to leave for a while and get some pizza if anyone wants some. If we get ahold of the Sokittoommee VHFers, we could make a hamfest out of this." shshsh"Break"shshsh skchunk

"Yeah, and what about this kids?" shshs –

"No problem. The high school is on vacation now so there should be a lot of baby-sitters available. Even on short notice. It's a natural. shshshshkchunk

"All right then. It's settled. I'll call up the host and hostess. Boy! Will they be surprised. It's a good thing they have a large house. Some coincidence, eh?" shshs –

"This is great. But what about the weather? It looks like it might start coming down and the weatherman says there's a pretty good chance of more of the white stuff and some icing over." shshsh –

"Well, there are a few hardy souls with four wheel drive cars. If it's not too bad, they might be willing to make the rounds and pick everyone up. There are only ten of our guys and six of the 'toommees and everyone is pretty close together anyhow." shshshskchunk

"I dunno. It could be pretty slippery, even for a four wheel drive. I'm not so sure any more that it's a good idea. Like, the slides will be good. That's a fact, but if it's snowing, the high schoolers won't be able to get out for the most part and most of us are parents and won't go out ourselves either. on a rotten night, it seems like that's the only time a family gets together. If it were really bad, I'd like to stay in with my family. Wait a minute . . . I'm listening to a weather report . . . high winds . . . slippery driving . . . rain, later turning to snow and sleet . . . low fog . . . Wow, it sounds pretty rotten right now. I wonder about tomorrow, Bill." shshsh"Break"shshkchunk

"Hang on, breaker. Y'know, Steve, maybe it was a lousy idea after all." shshs –

"No, Bill. It's just that the weather is so poor and driving is unpredictable. That's all. It's a good idea. It's just that the timing is off. Maybe for the next meeting we can all get together. Hey, I just got another idea. How about the two clubs setting up a joint repeater. Whadoyou think of that?" shshshkchunk

"I like that idea. What with two sets of brains in this town, we should get together to do something like that. I've been toying with the idea of putting one up myself." shshs –

"No. Go on, you couldn't do it and you know it." shsh –

"Really. I've even collected all the parts for one. I just gotta lash them all together." shshsh –

"You're fooling." shshsh –

"It's true. You can come over any time and see it all." shshshs –

"I still don't believe you." shshshkchunk

"Well, the proof is in the pudding. Speaking of pudding, that's what it looks like out there right now, and that's what I'll look like inside if I don't get some sleep. Say, whatever happened to that breaker. C'mon ahead breaker." shshshskchunk

"Yeah, c'mon ahead breaker." shshshskchunk

"Breaker, speak now or forever hold your peace." shshshkchunk

"One last chance." shshshshkchunk

"Steve, you don't suppose there was an accident, do you" shshshshshkchunk

"No, I doubt it. The guy sounded OK when he spoke. I don't think anything is wrong." shshshshkchunk

"But he tried to break in so many times" shshsh –

"Look. He would have said something if something was wrong. Wouldn't he have?" shshshkchunk

"Yeah. I guess you're right. Well, see you at the meeting." shshshshskchunk

"Right. This is W1XYZ clearing with WB1ABC at twelve-thirty on a mucky night. G'night." shshsh –

"G'night." shshshshskchunk

K1NUN/1

Ed Webb W4FQM/1
Technical Editor
73 Magazine

THE CASE FOR TONE ACCESS

Tone access is the best way to protect repeater inputs when two or more repeaters share a common input frequency. In many cases the coverage of the repeaters overlap each other and a mobile trying to access one may bring up several others too. This situation is highly undesirable as well as annoying to the monitors of the other repeaters, particularly if they have automatic logging. Tone access can be effective in eliminating these unwanted key ups and is used in three different modes: Continuous Tone Coded Squelch (CTCS), Tone Burst, and the "Whistle-Up."

Of all the tone access systems CTCS is the most positive as it will even work when the input signal to the receiver is quite noisy. In a CTCS system a small encoder is mounted in the mobile of base transmitter and supplies a subaudible tone in the range of 80 to 180 Hz to the audio input of the transmitter. Each time the CTCS equipped are placed on the air the CTCS tone is continuously transmitted at a level that is about 20% of the maximum speech deviation. In a typical narrowband system where the maximum speech deviation is ±5 kHz the CTCS deviation level is adjusted between ±750 Hz to 1 kHz. The repeater input receiver in turn is fitted with a CTCS decoder and this is used to control the repeater transmitter in place of the usual Carrier Operated Relay (COR). Thus the repeater can only be brought up by an input signal having the proper CTCS tone frequency, and when this signal goes off the air the repeater will drop out even though there is another signal on its input frequency. It is the CTCS tone that not only brings the repeater up but also holds it up and when there is no CTCS tone the decoder cuts the keying voltage off to the transmitter. (Of course there is normally a few seconds drop out time but the repeater does drop as this type of control is very positive. A CTCS system is fairly secure as the decoder will only respond to CTCS signals that are within ±1 Hz of the CTCS decoder frequency.) CTCS is widely used in Motorola calls their system "Private Line" or P.L., and General Electric calls theirs "ChannelGuard" or C.G. For those amateurs having commercial rigs the installation of a CTCS encoder is only a matter of wiring up the manufacturer's encoder in the unit. But for the ham who has an imported unit or a piece of older commercial gear the installation of a CTCS encoder has posed somewhat of a problem. But recently some small CTCS encoders have become available in the price range of $15–$25. These types of encoders use resonant reeds as the frequency determining device and you can figure on spending an additional $18.50 for the required reed.

Avcom[1] has also come out with a new small CTCS encoder that is quite different than the rest in the fact that it does not use a reed but a low frequency crystal instead. The crystal gives as good as or better than the necessary ±1 Hz stability and its cost is less than one third of the cost of the reed. Avcom calls their little CTCS encoder a PL100 and it is all solid state using both transistors and digital IC's. Its dimensions are 1.5 x 6.2 x 4.4 cm (0.6 x 2.4 x 1.75 in. [H x W x D]). The PL100 utilizes a crystal controlled multivibrator whose output is fed to three IC decade dividers to obtain the desired CTCS tone frequency. The output of the last decade divider is fed to a two section low pass filter to obtain a sine output. Suppose you want a CTCS frequency of 110.9 Hz (a standard CTCS channel frequency) – you would simply use a 1109 kHz crystal since the encoder divides its frequency by 1000. The PL100 also has a built-in voltage regulator since the logic requires 5 volts. The encoder will operate over 11 to 15V dc input and has adjustable high and low impedance outputs. The crystals for the PL100 are available from JAN Crystals[2] at $4 (per crystal) for 100 Hz and $6 for the proper crystal for any other CTCS tone. The Avcom PL100 is available in three forms: a PC board, parts list, schematic and pictorial for $6; a complete kit for $17.95; and the completely assembled unit for $24.95. All three forms require the addition of a crystal that is the desired CTCS tone frequency times 1000.

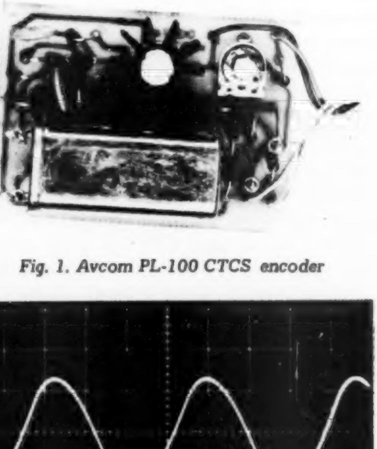

Fig. 1. Avcom PL-100 CTCS encoder

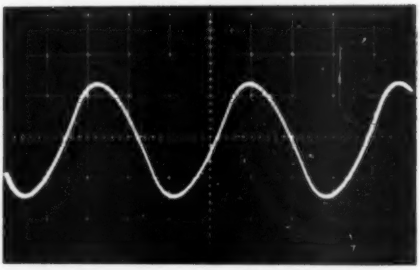

Fig. 2. Output waveform of Avcom PL100.

Tone burst access is the second form of tone access systems and is the simplest way to go as the frequency tolerances are not as critical as those of the CTCS system. Tone burst also allows a multichannel or multitone encoder that can be used on many repeater systems. A tone burst encoder is simply an audio oscillator whose output duration is controlled by a timing circuit. The timing circuit can be triggered by the grounding of the transmitter push-to-talk (PTT) lead or by the application of +12V dc to the encoder. Most tone burst encoders use the PTT type of keying that grounds a lead from the encoder when the mike button is pushed. Normally the tone burst duration is set at 500 ms. Some tone burst encoders have as many as six tone frequencies which is more than adequate. This allows the user to access a number of repeaters that have common input-output frequencies but different tone burst frequencies. The tone burst begins as soon as the operator pushes his mike button and lasts for a half second. This happens automatically each time the operator begins a transmission. However the operator must now remember to pause for a half second before beginning to talk thus giving the tone burst time to complete. If the operator were to speak during the tone burst the speech would interfere with the tone and the decoder at the repeater may be confused at the complex wave form and the repeater may not come up. The tone burst deviation is normally set to be 60% of the maximum speech deviation. A tone burst access repeater requires a tone burst decoder at the receiver site in addition to the COR. Both must give positive outputs before the repeater will come up on the air. The tone

[1] Avcom, P.O. Box 29153, Columbus OH 43229.

[2] JAN Crystals, 2400 Crystal Drive, Fort Myers FL 33901.

burst access system has one minor drawback – if there is another signal present at the repeater input after the initial tone up station goes off the air, the repeater will stay up until the three minute time-out time drops it out. Normally the tone burst decoder is reset by the COR dropping or by the time out timer activating. The tone burst decoder also resets the time out timer each time a tone burst is received.

Most tone burst encoders use an LC type of audio oscillator that has excellent frequency stability but requires precision capacitors or padding capacitors to set the oscillator exactly one frequency. Other tone burst encoders use RC oscillators, integrator oscillators, and Voltage Controlled Oscillators (VCO). All of these last three types have an advantage that the tone frequency may be set by the use of pots thus allowing the user to have a number of pots and a selector switch to select various tone frequencies. Each pot can adjust the oscillator over a range of about 1400–2600 Hz. These types of encoders are easily set to frequency by the use of a frequency counter and a screwdriver, and shorting the burst timing capacitor.

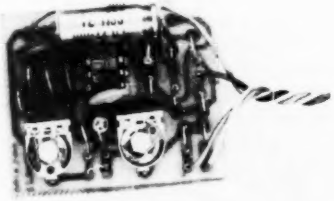

Fig. 3. Avcom TN421 tone burst encoder

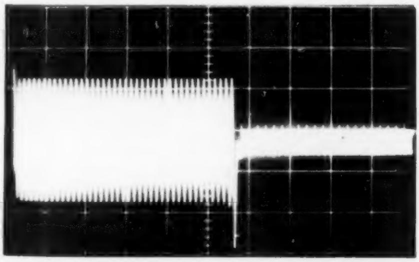

Fig. 4. Burst envelope of Avcom TN421. Horiz. = 100 MS/cm. Note: Extra ripple was due to stray ac pickup in test gear.

The Avcom TN421 is an integrator oscillator type of tone burst encoder using only one IC and an RC burst timing network. It is so small that it can be mounted in the Drake TR-22 with ease. The TN421 is only 1.5 x 4.5 x 3.8 cm (0.6 x 1.8 x 1.5 in. [H x W x D]). It only requires the connection of three wires to hook to a transceiver: +12V dc, audio to the mike input, and a wire to the PTT connection. The TN421 has a frequency range of 1400–2600 Hz and has adjustable high and low impedance outputs provided. It has a nominal 600 ms tone burst. The TN421 is available from Avcom all built and ready to go for only $19.95. It will also fit in a commercial rig control head.

The third type of tone access system is the whistle-up which is a form of the tone burst except that the frequencies used are between 1500 and 1800 Hz. The decoders are about 100 Hz wide as are the ones for the normal tone burst frequencies. Due to the lower frequencies the average ham can whistle the proper tone and bring up the repeater. There are many different types of CTCS and tone burst decoders. Most commercial and ham decoders use resonant reeds for the CTCS and LC circuits for the tone burst frequencies.

A new type of tone decoder is appearing on the horizon in the form of a Phase Locked Loop tone decoder. One such device is the Signetic NE-567 and will work with a −6 dB signal plus noise-to-noise ratio. This gives very impressive performance. Its tone decoding frequency may be set by use of a pot and a frequency counter. There is no input signal required to adjust the NE-567 as all that is necessary to do is to monitor the VCO frequency with a counter to set the decode frequency. The bandwidth may be set from a few hundred Hz to about 10 Hz depending on your needs. It has a frequency range from a few Hz to several hundred kHz.

So if your carrier access repeater is being bothered with unwanted key ups from other systems and/or if you are being bothered with intermod or stray signals, tone access is the answer. The equipment is available now so you *can* do something about it rather than gripe about it. It's not complicated nor expensive and it is a solution that works.

. . .W4FQM/1

Forrest D. Thomas K9MRL
3335 Central Ave.
Columbus IN 47201

CUSTOMIZED AFSK-MCW & CODE PRACTICE OSCILLATOR

The complete AFSK-MCW, and code practice oscillator using an IC circuit is built into a standard 4x2¼x2¼ in. minibox. A printed circuit board is used, and careful placement of parts is necessary in order to get all the parts into the box.

Obtain one jack and a plug like the one on the transmitter to be used. Mount the jack on one end of the box, and bring the plug out the other end using shielded cable. Mount all components in the box. It would be a good idea to tune the coil and check its operation first. So, with the switch in one position, normal mike control can be used. With the switch in the other position you can key the transmitter, and insert AFSK-, or MCW at the mike input, and at the same time cut off the speaker. Any combination of switching arrangements can be used to suit your particular needs. Even a small relay could be used.

To use as a code practice oscillator, no connections to the transmitter are necessary. Plug a speaker into the speaker jack (voice coil is not critical). Plug a key into the key jack. You can use either the 2125 Hz tone, or break the connection at the keyboard connection, and use the 2975 Hz tone.

Sw#1 is a 3 pole double throw switch to fit your need, and Sw2 is part of the mike control system.

Parts other than C1, C2, and C3 are not critical. These should be mylar capacitors. Do not use ceramic or disc capacitors since these tend to cause drift.

Tuning of L1 can be done by varying the capacity of C1 and C3, or taking turns off of L1. For best results you should be very close to frequency. With the keyboard jack closed you should have a 2125 Hz tone; with it open you should have a 2975 Hz tone. In some cases a polar relay, a high speed relay, may be necessary across the printer contacts to key the oscillator.

. . .K9MRL

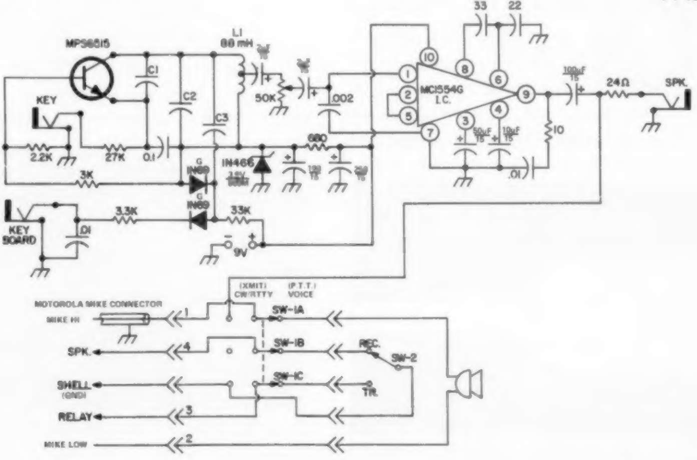
MPS6515
KEY
C1
C2
C3
L1
88 mH
50K
.002
33
22
MC1554G
I.C.
10
8
6
1
2
5
9
3
4
7
50μF
15
10μF
15
100μF
15
24Ω
SPK.
10
.01
2.2K
27K
0.1
3K
G
IN69
G
IN69
IN466
680
3.3K
33K
KEY
BOARD
.01
9V
(XMIT)
CW/RTTY
(P.T.T.)
VOICE
MOTOROLA MIKE CONNECTOR
MIKE HI
SPK.
SHELL
(GND)
RELAY
MIKE LOW
1
4
3
2
SW-1A
SW-1B
SW-1C
REC.
SW-2
TR.

Fig. 1. Integrated circuit AFSK-MCW or code practice oscillator.

Raymond Megirian K4DHC
Box 580
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USING THE LM 373

About 2 years ago a new integrated circuit was announced by National Semiconductor and was labeled the LM373. Inside the little TO5 can were the makings of 4 gain stages, an agc section, a balanced mixer and a peak detector. At least that's what the poop sheet said, and circuits were shown for using the little jewel in various types of i-f strips. I was fortunate at that time to acquire an LM373 and promptly breadboarded an SSB i-f strip to see how it would perform. It performed amazingly well and I was sufficiently impressed to start planning a receiver designed around this new IC.

Although I didn't know it at the time, all the ingredients for a classic demonstration of Edsel Murphy's Law were gathering for the final curtain. The clincher came when word got around that the manufacturer had thrown in the towel. That's when Murphy struck and left me with a crisply burned collector's item.

Now, 2 years later, I once again own an LM373 and have been assured by the company rep that these items are here for keeps and are available from distributors.

The present LM373 is basically the same as its predecessor, including pin connections, although internal circuitry is somewhat changed. The device will perform many diverse functions which make it adaptable to AM, FM, or SSB i-f systems by merely changing a few connections. In the application described here, the IC is used in a receiver capable of operating in either AM or SSB modes. It was made small only because my hangup is miniaturization. It is designed to cover 3.5 to 4.0 MHz and an all-band converter will someday be used ahead of this "tuneable" i-f. If the cabinet had been about an inch larger, I might have gone all the way right from the beginning.

Let's take a look at this new device and see how it may be used to perform the functions of particular interest to the ham. Figure 1 shows how the various sections of the circuitry are tied together internally and which points are brought out to pin connections. Note that the IC is divided into 2 separate areas having no common internal signal path. The upper portion, consisting of 2 gain stages and the agc section, is externally coupled to the remaining circuitry by the main selectivity determining device. This usually consists of a mechanical, ceramic, crystal or LC filter operating in the 50 kHz to 15 MHz frequency range.

In order to better understand just how the various sections of the LM373 can be made to perform the desired functions, let's look at some block diagrams. Figure 2 shows

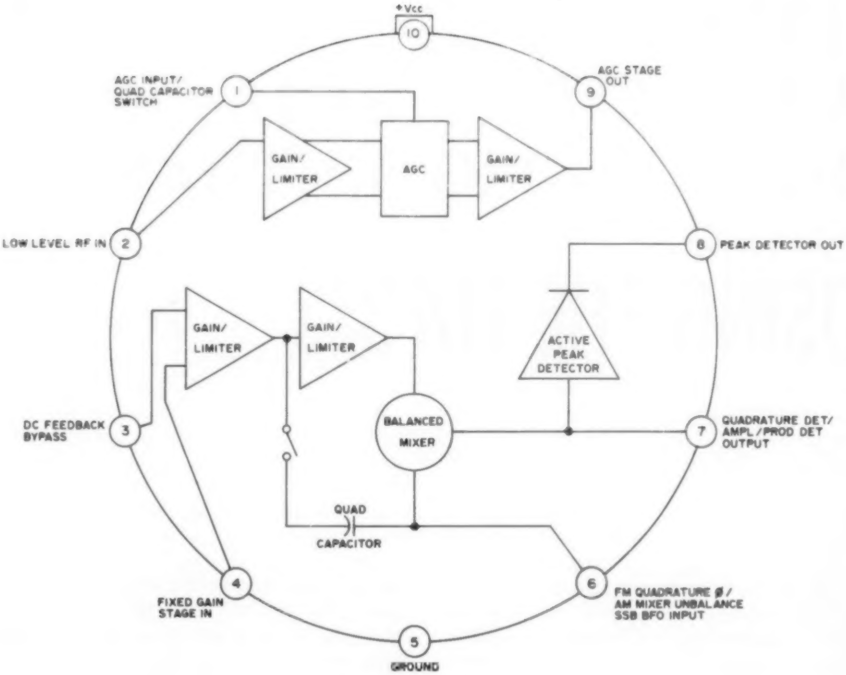
+Vcc
10
AGC INPUT/
QUAD CAPACITOR
SWITCH
1
AGC STAGE
OUT
9
GAIN/
LIMITER
AGC
GAIN/
LIMITER
LOW LEVEL RF IN
2
8
PEAK DETECTOR OUT
GAIN/
LIMITER
GAIN/
LIMITER
ACTIVE
PEAK
DETECTOR
DC FEEDBACK
BYPASS
3
BALANCED
MIXER
7
QUADRATURE DET/
AMPL/PROD DET
OUTPUT
QUAD
CAPACITOR
4
FIXED GAIN
STAGE IN
6
FM QUADRATURE Ø/
AM MIXER UNBALANCE
SSB BFO INPUT
5
GROUND

Fig. 1. Pin connections and internal wiring of theLM 373.

the connections used for operating in the AM mode. In order to disable the balanced mixer for this mode, an offset voltage is introduced at pin 6 by means of a resistor. Agc voltage is taken from the output of the peak detector and connected to the agc input at pin 1 through an RC network with the desired attack/decay characteristic. An agc range of 70 dB with operation down to 50 μV rms input is possible with this circuit.

For SSB/CW operation, refer to the block diagram of Fig. 3. A bfo signal of 25 mV rms or greater is fed into the balanced mixer at pin 6, causing the mixer to act as a product

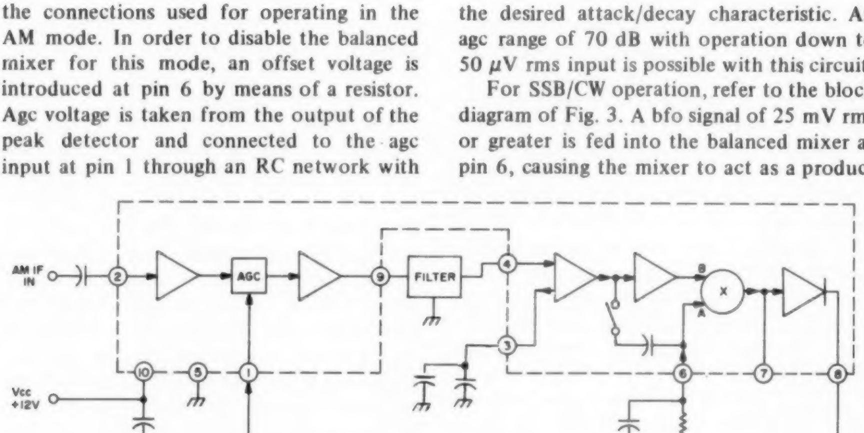
AM IF
IN
2
AGC
9
FILTER
4
B
X
A
3
10
5
1
6
7
8
Vcc
+12V
AGC
R
C
AUDIO
OUT

Fig. 2. AM i-f block diagram.

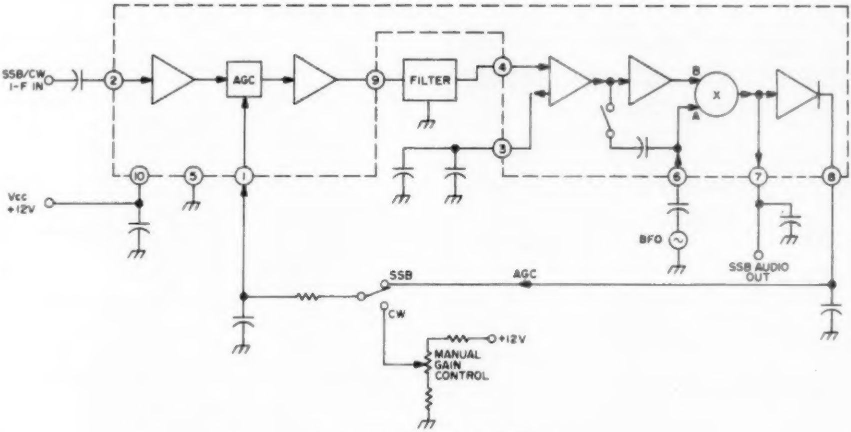

Fig. 3. SSB/CW i-f block diagram.

detector. The peak detector generates an agc voltage derived from the audio fed to it from the product detector. This voltage is fed back to the agc section through the RC network. A means of providing manual gain control for CW operation is also shown in the block diagram. So here we have an i-f amplifier, a fast attack, slow release audio derived agc system and a double-balanced product detector all in one neat package.

Although I have not tried the LM373 in an FM receiver, some readers may be interested in this type of operation and Fig. 4 is the block diagram for an FM i-f system. By grounding pin 1, the agc is defeated and all gain stages become symmetrical non-saturating limiters. This action also connects an internal quadrature capacitor to pin 6 which is also input A of the quadrature detector. An LC network tuned to the nominal i-f frequency is connected externally to pin 6. This network produces a frequency-dependent phase shift with respect to the signal at input B of the quadrature detector. A pulse duration modulated output is produced by the detector and integrated by the capacitor connected to pin 7. The Q of the quadrature network will influence both the output level and the distortion. For a given deviation, increasing Q will increase both output and distortion. At least a 50 mV rms signal is required at pin 6 to ensure switching action of the detector and maximum output. Audio at a higher level may be taken from the output of the peak detector at pin 8.

In addition to the applications above, this versatile IC may be used in several other interesting circuits. These include SSB generator with alc, constant amplitude/amplitude modulated rf oscillator, first i-f amplifier/

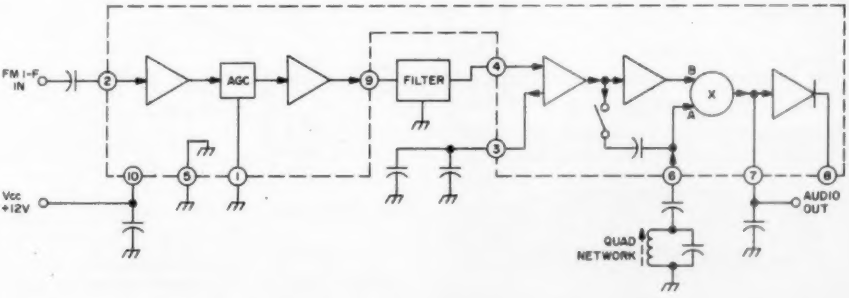

Fig. 4. FM i-f block diagram.

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Total Boom Length	11′
Turning Radius	7′-10″
Total Weight	23 lbs.
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

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Power Rating	1400 Watts P.E.P.
El. Length	11′
Turn. Radius	7′
Total Weight	13 lbs.
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

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MULTIBAND COAXIAL ANTENNA for 6 - 10 - 15 - 20 METERS

Needs no ground plane radials. Full electrical ½ wave on each band. Excellent quality construction. Mount with inexpensive TV hardware. Patented.

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Total Weight	6 lbs.
Height	11′
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

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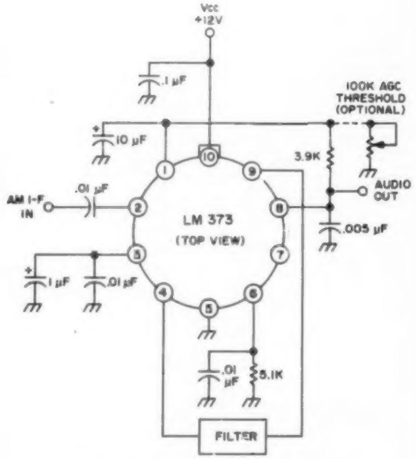
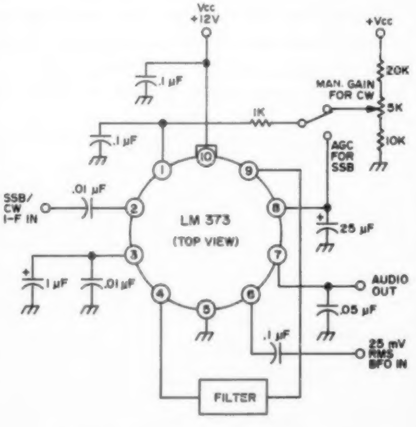


Vcc
+12V
.1 µF
10 µF
100K AGC
THRESHOLD
(OPTIONAL)
3.9K
AUDIO
OUT
.005 µF
.01 µF
AM I-F
IN
LM 373
(TOP VIEW)
1
2
3
4
5
6
7
8
9
10
1 µF
.01 µF
.01
µF
5.1K
FILTER

Fig. 5. AM i-f strip wiring diagram.

second mixer and as a video amplifier with agc, manual gain or gating. There are others too, but unfortunately we can't cover them all at this time.

If you are mainly interested in using the LM373 in your own designs, Figs. 5, 6 and 7 are schematics for use in the various modes discussed above. Notice that in all circuits, ac coupling is used for signal transfer. Dc paths in integrated circuits of this nature can cause excessive currents to flow, resulting in possible destruction of the IC. The bypassing at pin 3 should be accomplished with a low



Vcc
+12V
+Vcc
.1 µF
20K
MAN. GAIN
FOR CW
5K
1K
.1 µF
AGC
FOR
SSB
10K
.01 µF
SSB/
CW
I-F IN
LM 373
(TOP VIEW)
1
2
3
4
5
6
7
8
9
10
25 µF
1 µF
.01 µF
AUDIO
OUT
.05 µF
.1 µF
25 mV
RMS
BFO IN
FILTER

Fig. 6. SSB/CW i-f strip wiring diagram.

MEMORY-MATIC 500 KEYER
Today's newest and most advanced keyer. 500 bit/40 character Read-Write memory. Stores any message instantly. Near-Full and overload alarms. Includes all Space-Matic 21 features.
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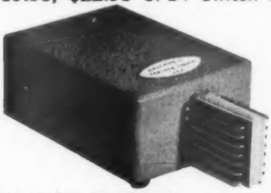
$19.95, $22.95 SPDT Switch Option



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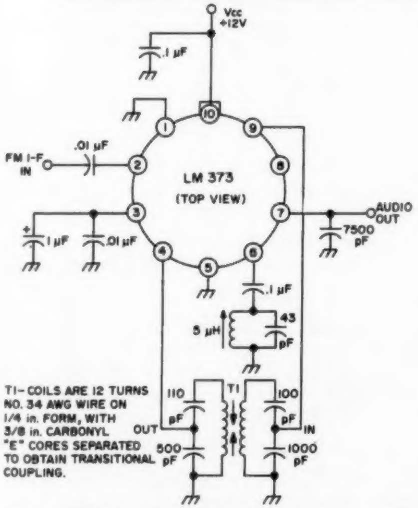


T1– COILS ARE 12 TURNS NO. 34 AWG WIRE ON 1/4 in. FORM, WITH 3/8 in. CARBONYL "E" CORES SEPARATED TO OBTAIN TRANSITIONAL COUPLING.

Fig. 7. FM i-f strip wiring diagram shown with transformer interstage coupling.

inductance high frequency capacitor and a larger tantalum for the low frequencies. You should also observe the usual rules of good layout practice and keep leads short when working with high gain circuits such as this.

Figure 8 is a schematic for the front end of the receiver I built using the LM373 in the i-f system. The rf and hf oscillator stages both use an inexpensive 2N3819 plastic junction FET. The mixer uses a dual gate MOSFET. Another 2N3819 is used as a source follower to isolate the hf oscillator and prevent pulling. A small transistor type i-f transformer couples the mixer to the LM373.

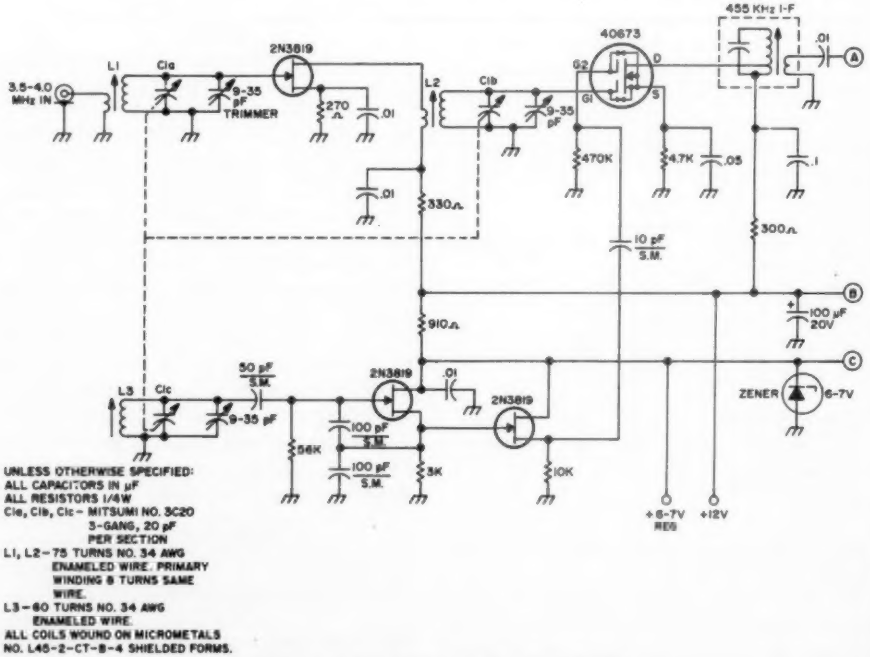
Figure 9 is a schematic for the remainder of the receiver; including the i-f, bfo and audio portions. In order to operate the i-f system in both AM and SSB modes, it was necessary to incorporate a 5-pole, 3-position switch, S1, to make the transfer. Two of the poles are used to switch the agc time constant components from AM to SSB. Another pole provides bfo input to pin 6 for SSB operation or an offset voltage for AM. Pole number 4 selects audio output from pin 7 for SSB or pin 8 for AM. The final section applies voltage to the bfo for SSB/CW reception. S2 is a small SPDT toggle switch used to go from manual gain control to normal agc when in the SSB/CW mode. The manual gain control is useful when listening to CW.

A second i-f transformer is used for the bfo tank and is tuned by a dc voltage applied across a capacitor diode. I used a V47 but many ordinary silicon diodes will work satisfactorily in this application. Epoxy rectifiers are also a good bet. Depending on the frequency variation obtained, the 27 pF series capacitor may have to be altered for proper tuning range. If range is insufficient, increase the value of the series capacitor. If bfo range is greater than needed, a smaller capacitor may be used.

Operating voltage for the hf oscillator, the bfo and its tuning diode is regulated by a zener diode. Almost any small zener in the region of 6 to 7V may be used. The base/emitter junction of a silicon transistor makes an excellent zener and no doubt several can be found with 6 to 7V breakdowns. With these critical circuits regulated, the main supply can be varied from 9 to 15V without producing any noticeable change in the received signal other than audio output. A 2N3819 source follower further stabilizes the bfo.

Because I wished to keep size to a minimum, I used a tiny 455 kHz ceramic ladder filter as the interstage coupling device for the LM373. This filter, the Murata CFS-455J, has a 3 dB bandwidth of 3 kHz and is adequate for general use. I used a printed circuit board for assembling the receiver and arranged it to take either the ladder filter or a Murata SFD-455B dual section filter. This provides about 4.5 kHz bandwidth at 3 dB. Because this is not a construction article in the strictest sense, and because some of the components dictated board layout not compatible with most junkboxes, a printed circuit layout has not been included.

I incorporated an audio preamp since I like to have a little reserve when it is needed. This stage can use almost any NPN audio transistor and is not at all critical. The transistor I used was an unmarked refugee



UNLESS OTHERWISE SPECIFIED:
ALL CAPACITORS IN µF
ALL RESISTORS 1/4W
C1a, C1b, C1c – MITSUMI NO. 3C20
3-GANG, 20 pF
PER SECTION
L1, L2 – 75 TURNS NO. 34 AWG
ENAMELED WIRE. PRIMARY
WINDING 8 TURNS SAME
WIRE.
L3 – 60 TURNS NO. 34 AWG
ENAMELED WIRE.
ALL COILS WOUND ON MICROMETALS
NO. L46-2-CT-8-4 SHIELDED FORMS.

Fig. 8. Schematic of the front end of K4DHC's receiver.

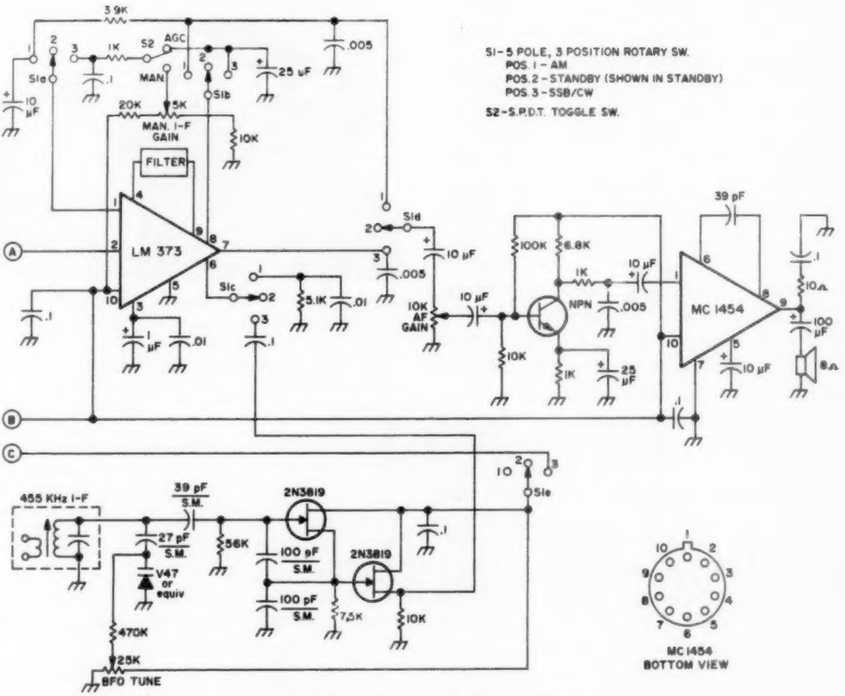

S1-5 POLE, 3 POSITION ROTARY SW.
POS. 1 - AM
POS. 2 - STANDBY (SHOWN IN STANDBY)
POS. 3 - SSB/CW
S2-S.P.D.T. TOGGLE SW.
3.9K
.005
AGC
S2
MAN
1K
S1a
S1b
S1c
S1d
S1e
10 µF
25 µF
20K
5K
MAN. I-F GAIN
10K
FILTER
LM 373
MC 1454
100K
6.8K
NPN
39 pF
10 µF
.005
10K AF GAIN
5.1K
.01
1 µF
.1
25 µF
10Ω
100 µF
8Ω
455 KHz I-F
39 pF S.M.
27 pF S.M.
V47 or equiv
56K
2N3819
100 pF S.M.
7.5K
470K
25K BFO TUNE
MC 1454 BOTTOM VIEW
A
B
C

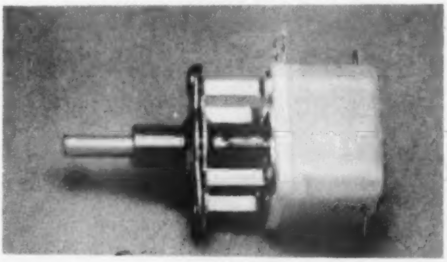
Fig. 9. Schematic of the bfo, i-f and audio portions of K4DHC's receiver.

from my junkbox. A Motorola MC1454 IC power amplifier is used in the audio output stage. It is capable of 1W of audio into an 8Ω load. I've had excellent results with this IC and have used it in many projects. The small speaker built into the receiver doesn't do the audio justice, but does make the receiver self-contained.

At present a block of 8 pen cells soldered in series powers the receiver. No-signal current drain is about 28 mA, rising to 40 or 50 mA on audio peaks at normal room level. At these levels it is not necessary to heatsink the audio amplifier.

Construction of the receiver is unorthodox in some respects because of my desire to keep it small. Since some of the ideas used here may be of interest to others, I'll go over the main points.

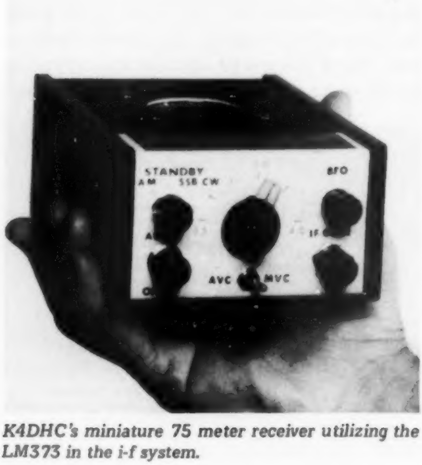
The front end tuning capacitor is a tiny 3-gang film dielectric type of 20 pF per section. It is driven by an equally small 4.5:1 ball drive attached directly to the tuning capacitor. Unfortunately, a pointer was not available for this drive but one was fashioned quite easily and can be seen in the photograph. The 3 trimmers, Erie style 538, were mounted on the capacitor and the whole assembly fastened to the front panel along with the other controls. This saved considerable board space and did not add anything to the space required behind the front panel.



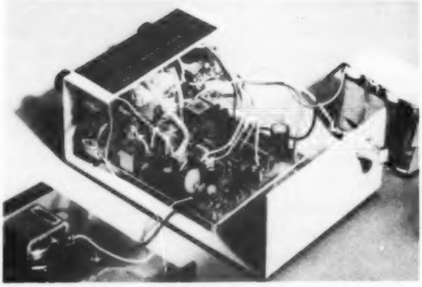
The 3-gang miniature tuning capacitor with reduction drive attached. Homemade pointer is push-fit over the large (direct) shaft.

An additional saving was achieved by mounting as many components as possible on the mode selector switch, S1. Since panel area was scarce, I used a small diameter Japanese rotary switch having 3 decks with a total of 9 poles and 3 positions. This is a Lafayette part number 99F61715 which lists for only 79¢. Since it is a shorting type switch, it was necessary to use position 1 and position 3 of each section to avoid shorting circuits during transfer. An unexpected bonus resulted, however, when the middle position worked out fine for "Standby." Since the switch has many more contacts than required, unused lugs made convenient tie points for mounting the associated resistors and capacitors. With these savings, the printed circuit board for the entire receiver ended up being a 3-in. square.

I think that most will agree that the principal limiting factor in shrinking equipment size, is front panel space. Half-inch knobs seem to be the smallest practical size, and even then you need finger room in between controls. The Ten-Tec cabinet I used is the smallest of their JW series. Actual panel space is 2-¼ x 3-5/8 in. As can be seen in the photograph, there isn't much room left over.



K4DHC's miniature 75 meter receiver utilizing the LM373 in the i-f system.



Interior view of the receiver. The LM373 is just behind the i-f transformer in the middle of the board. The 3 kHz ceramic ladder filter is just to the right. The pen cell battery pack normally sits in the space between the board and back panel of the cabinet.

If you build up a copy of this receiver and use the specified coil forms, a suggestion may be in order. After alignment is completed, put a small ball of coil wax in the opening of the oscillator coil and melt it down with the tip of a small soldering iron. The bobbins in these coil forms sometimes do not fit tight and cause microphonics or instability in the oscillator output. The wax holds the bobbin tight and prevents any of these problems.

That covers the basic uses of the LM373 and may have set you to thinking about applying this versatile device to some of your own pet projects. It should be pointed out that the version discussed here is the limited temperature range LM373H in a TO5 can. Price is $4.85 in small quantities. A 14-pin DIP version, the LM373N, was to be made available at slightly lower cost but I hadn't checked on this at the time of writing.

For those who may be interested, I have a limitied supply of the uncommon components used in the receiver. This includes the 3-gang tuning capacitor, the ball reduction drive, Murata filters and shielded coil forms. Drop me a line for information.

Results to date using this i-f system have been quite gratifying. The LM373 provides more than adequate i-f gain at 455 kHz and the agc acts without any noticeable pumping. Overall, the use of this device has drastically cut component count while providing excellent circuit performance.

If you are wondering about the weird nameplate on top of the receiver, it came about because I had to cover some bad scratches and it seemed the only way to do it.

. . .K4DHC

Ken W. Sessions, Jr. K6MVH

REPEATER SITE BREAK-IN ALARM

. . . Lets you hear what the burglar is saying as he robs you blind.

It was very warm in my non-air-conditioned repeater building and I had been working through the most scorching period of the hottest day of the year putting in a new control system. I was tired and dusty and irritable and impatient. I just wanted to get home. So, when it was well past time for supper, I made a batch of temporary alligator-clip connections to keep the repeater operational and went on down the hill. Since I planned to return first thing in the morning, I left all my test equipment and tools at the site.

When tomorrow rolled around, I was still tired. The repeater seemed to be perking right along without any trouble, so I put off making the trek. It wasn't until a week had gone by that the repeater finally crapped out completely and I *had* to visit the site. And when I did, I wished I'd returned the day after my earlier visit. When I unlocked the building and went inside, I was stunned. My test equipment – some of it borrowed – was gone! My tools were gone! The only thing remaining intact was the repeater itself. I had been robbed!

Someone had either jimmied the door or somehow managed to unlock it. My initial

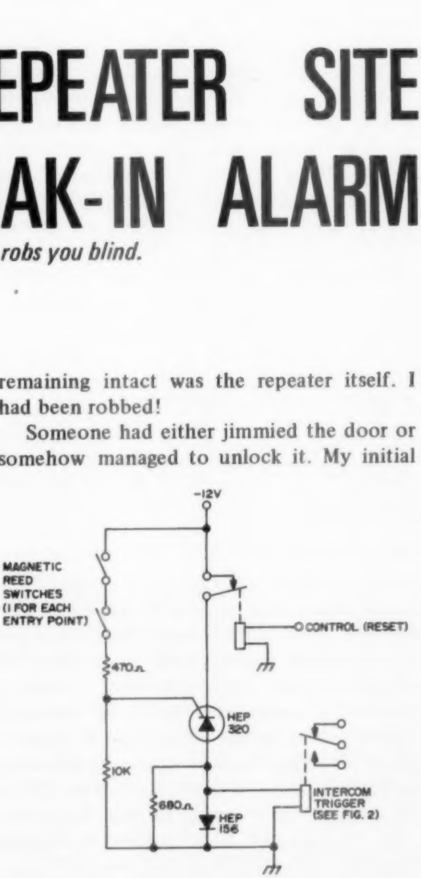

-12V
MAGNETIC REED SWITCHES (1 FOR EACH ENTRY POINT)
CONTROL (RESET)
470Ω
HEP 320
10K
680Ω
HEP 156
INTERCOM TRIGGER (SEE FIG. 2)

Fig. 1. Basic repeater intercom alarm. After the circuit has been triggered, any short pulse applied to the reset relay will cancel the alarm, resetting the system.

reaction, after that first shock wave, was fury – but not fury at the thief; I was angry with myself! I had a superb automatic communications system up there that could have been used to warn me of an unwelcome intruder. But I had not had the foresight to use it for that purpose. Then and there I made up my mind never to install another repeater without an automatic alerting device to let me know when the site is being "visited." Admittedly, that was like locking the corral after the steers have been rustled, but at least I could be relatively certain of hanging onto the next herd.

Getting an alarm into service was painfully simple – the fact of which simply served to make me even more upset with myself for not thinking of it sooner.

Thinking that the thief (or thieves) might return for more of my goodies some day, I decided to employ a warning system that was covert by nature; that is, I wanted to be alerted that someone was tampering, but I didn't want to alert the tamperer to the fact that I knew he was messing around where he didn't belong. So my idea was to use an intercom system connected to a door-actuated switch, which would key the UHF control repeater and let me actually hear what was happening on the hill. (I didn't connect the intercom to the regular open repeater because I couldn't help thinking that the thief *could* be someone who monitors and uses it – unlikely as that thought seemed to be.)

Alarm Circuit

The basic circuit I used for triggering the alarm system was similar to the one shown in Fig. 1. The circuit pictured here, developed by Motorola engineers as an automobile burglar alarm, draws less than 1 mA of constant current, so there's no need to worry about power requirements, even if your repeater is battery operated. Since the voltage required is on the order of 12V, a dropping resistor would be in order if you plan to operate from a 28V dc control system.

If your repeater site employs a UHF control repeater in conjunction with an open repeater in the VHF band, you'll probably want to employ the same operating philosophy that I used. I connected the alarm so that when it is actuated, the open repeater goes off the air and the control repeater goes on. This is accomplished by rerouting some of your existing audio connections. Cut the 2m push-to-talk lead that keys the UHF repeater and reroute it through the normally closed contacts of the alarm relay. Do the same with the 2m audio lead. The rerouted leads are shown in Fig. 2.

The way the system works is simple: The open repeater normally feeds signals to the UHF repeater through the alarm relay contacts. But when the alarm circuit is triggered, the UHF repeater becomes completely disengaged from the 2m repeater (even though the 2m system can continue to function independently, without UHF interconnect, if you want it to). The alarm circuit keeps the UHF repeater on the air until you, at the control point, transmit a tone command to reset the alarm.

While the alarm is actuated, the UHF transmitter mike circuit is being fed with a special homebrew microphone – comprised of an ordinary speaker and an output transformer. (The output transformer, by the way, can be any old tube-type "plate-to-voice-coil" transformer such as the type typically found mounted on the back of speakers in ac-dc broadcast-band radios.)

The higher the impedance of the mike side of the transformer, the better – but if you get hum, you'll have to use shielded wire and perhaps enclose the transformer in a chassis all by itself.

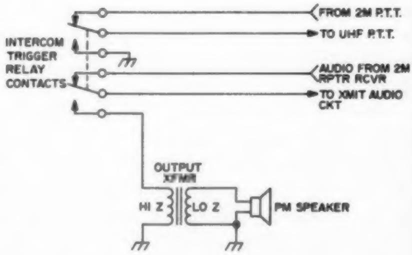


Fig. 2. The existing repeater-to-UHF audio interconnects should be reourted through the intercom trigger relay so that the UHF control repeater hears only the action at the site in the event of a burglary.

Make a few checks after you get the contrivance wired up just to see if the intercom is sensitive enough to pick up soft voices from anywhere in the repeater building. If not, just incorporate a simple audio amplifier between the speaker "mike" and the transmitter's audio line.

You may want to use the same approach I did with respect to keeping the mike hidden. I used the built-in speaker on the rpeater cabinet as the mike. (It doesn't have the best audio quality in the world and would never win any fidelity awards, but it did the job.) I installed a switch so that when I was working on the repeater I could use the speaker as it was originally intended. The hook-up for this is shown in Fig. 3.

If you use this technique, you'll have to remember to reposition the switch to the ALARM spot when you're ready to leave the site; otherwise you'll hear nothing when the burglar makes his appearance.

Triggering

Every repeater site has its own individual weaknesses from the standpoint of burglary susceptibility. Since my site had but one door and no windows, my problems were minimal. I simply installed a magnet on the door and a magnetic reed switch adjacent to it on the wall. If your site has more than one door, or a window or two, you'll want to install a magnetic reed switch at each possible entry point – or use the photoelectric alarm approach described later.

There's no requirement for using magnetic reed switches, but they offer the advantage of being very small and highly reliable. Also, it will mean that you won't have to run a wire across the door itself.

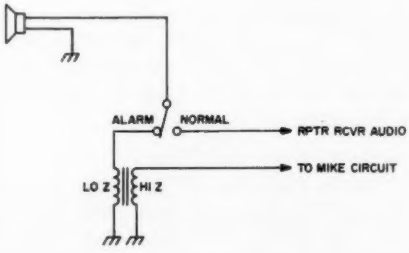


Fig. 3. A simple switch can be used to make your repeater receiver speaker double as an intercom microphone.

Relays

The reset relay should be capable of operation from whatever dc control voltage your particular repeater system uses. Since nothing more than momentary opening of the contacts is required, virtually any control system that can provide a short voltage pulse on command will be adequate.

The intercom trigger relay is a Potter-Brumfield type RS5D, which has a 6V dc coil whose resistance is 335Ω. You should stick to that relay or its equivalent if you don't want problems. A lower value of coil resistance could cause excessive current to be drawn, possibly resulting in thermal destruction of the semiconductors. Higher resistances are all right, of course, but make sure the relay contacts will be able to handle the loads you'll be switching. The P-B relay shown can handle loads of up to 2A, which should be more than adequate for the push-to-talk and audio requirements of most repeaters.

The diode across the relay coil provides a discharge path for any induced voltage spikes. Without it, the coil's collapsing field can generate a momentary high-voltage spike that might be too much for the semiconductors in the circuit. Don't install the diode backwards, either, or the diode will shunt the direct current around the relay coil directly into the SCR – which could mean curtains for your HEP 320.

Alternate Approach

If your site doesn't lend itself well to installation of magnetic reed switches, or if there are other groups who use your building, you might want to try a protection system that is less likely to be triggered inadvertently. One such method involves the installation of an "electric-eye" across the area in the building adjacent to where your repeater is located.

If you use this approach and there are other lessees in the same building, be sure to let them know of the alarm so they won't trip it when they're working on their own equipment.

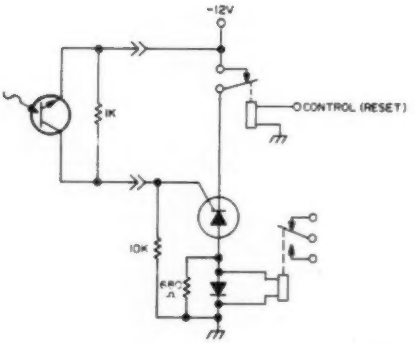


Fig. 4. The alarm circuit can be easily adapted to a photodiode beam-type protection arrangement by replacing the reed switches with a photodiode and a resistive shunt.

As you can see by comparing Figs. 1 and 4, there aren't many differences between the two alarm systems. All components that are unmarked in Fig. 4, as a matter of fact, are of the same value as those shown in Fig. 1.

You'll need a simple lens assembly to focus light from the source across the access path to the photodiode. This shouldn't prove any great problem, though, because any old flashlight should prove capable of handling that job with ease. You won't want to use batteries, of course, because they'd be gone before you could even get to the bottom of the hill. Just replace the batteries with a dc voltage from your normal control system.

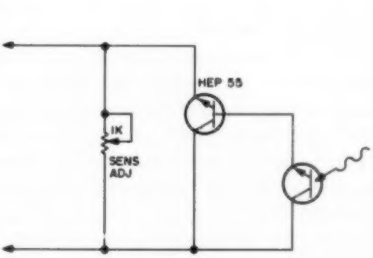


Fig. 5. Addition of a HEP 55 amplifier and substituting a pot for the fixed resistor in Fig. 4. will considerably increase the sensitivity of the circuit and will permit the light beam to span a greater distance.

If the flashlight can't provide a good, fairly high-intensity spot of light, you can modify it by moving the bulb back and forth within the reflector until an effective spot is obtained. Most flashlights will be good for about 6 ft. You can increase the sensitivity of the alarm circuit, though – thus increasing the beam distance capability – by adding a simple amplifier circuit as shown in Fig. 5.

The high-sensitivity amplifier and photodiode go into the circuit at the point in Fig. 4. where the photodiode and 1 kΩ resistor are connected. As you can see, the 1 kΩ resistor is still in the circuit, but now it's in the form of a pot so that circuit sensitivity can be adjusted.

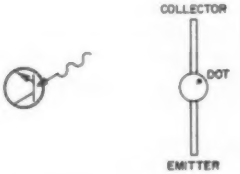


Fig. 6. Photodiode symbol and bottom view of Motorola's HEP 312.

If you haven't worked with photodiodes before, you might not be familiar with their layout. Figure 6 shows the symbol and the lead layout of the HEP 312. As you can see, the photodiode is a two-lead device, and it consists of a single PN junction. When light strikes the little collimator lens, current flow across the junction increases. With the junction reverse-biased, the increase is substantial.

Naturally, the lens of the photodiode has to be oriented for best light-capturing ability. If the repeater site is well illuminated, you'll have to put a lttle tubular shield around the diode to keep it from being triggered by extraneous light.

Semiconductor Availability

All the Motorola HEP devices described in this article are available from *Circuit Specialists, Inc., Box 3047, Scottsdale, Arizona.* The magnetic reed switches are available from *GC Electronics, Division of Hydrometals, Inc., Rockford, Illinois 61101.*

. . .K6MVH

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MOTOROLA T44 BASE STATION CONVERSION

Conversions of the Motorola T44 450 transceiver to 100V probably come in as many versions as there are persons converting them. Although not guaranteed to be the ultimate, this conversion does offer two distinct advantages, simplicity and versatility. A very minimum of time and components is required. Most of the parts are readily available from the average junkbox. The only items which may present a problem are the 6.3V transformers. The conversion in no way impares the operation of the T44 on 6/12V dc. All that is necessary to change from mobile to base station is to remove the vibrators and insert the jumper plugs, and position the control voltage selector to ac. Fuses F3 and F4 must be replaced with 20 amp fuses.

The first step in the conversion is to prepare the two vibrator jumper plugs. Any of several methods may be used; however, the easiest method is to cannibalize a pair of burned out vibrators for their bases or use an old 7 pin tube base. Alternatively, short pieces of 10-gage wire will fit into the vibrator sockets quite nicely. The function of the jumper is to short pins 1 and 5 to pin 7 (ground). (See Fig. 1)

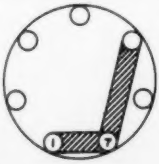

Fig. 1. Jumper plugs.

The next step is to locate the small brown wire connected to terminal 3 of terminal strip TB1. (TB1 is the second transverse terminal strip from the front of the power supply.) Unsolder this brown wire from terminal 3 and move it to terminal 6 of TB1. Then wire in selector switch, connecting the two diodes and capacitor as shown in Fig. 2.

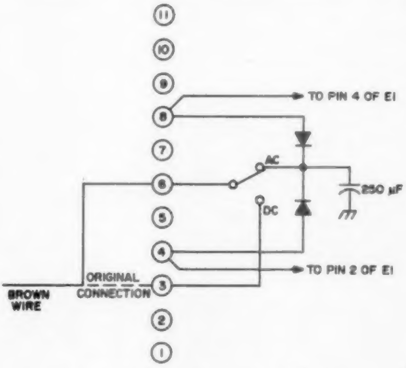

Fig. 2. Terminal board 1 (TB1)

Then connect terminal 8 to pin 4 of the vibrator E1. Connect terminal 4 to pin 2 of vibrator E1. Schematically the changes are shown in Fig. 3. This completes the equipment conversion.

(cont. on page 103)

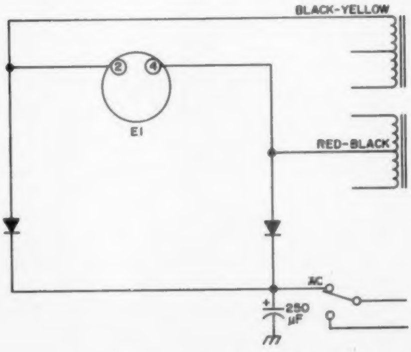

Fig. 3. Schematic of modification.

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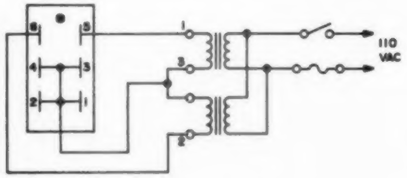

Fig. 4. External power supply.

The final step is to build the external power supply. Since this is to be a base power supply, it might be handy to build the power supply and the control head into a single unit. I will only show the power supply portion. The rest will be governed by imagination, pocketbook or your Frau's aesthetic desires. The major ingredients are the two 6V-18 amp transformers. The external power supply schematic is shown in Fig. 4. The phasing of the 6V windings is important. When properly phased, the voltage from point 1 to ground and point 2 to ground should be 6V, and the voltage from point 1 to point 2 should be 12V.

. . .K0MOC

REPEATER
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Fixed Base Operation of the HR-2 Transceiver

he Regency HR-2 Mobile Transceiver is a fine, high-quality piece of mobile 2-meter FM gear.[1] However, its "no-frills" design allows for quite a bit of individual leeway in the modification of the HR-2 for base station use.

Power Supply

Since the HR-2 operates from +12V dc, the first order of business is the design of a power converter between wall juice (117V ac and 12V dc.)Figure 1 shows the schematic diagram of a supply designed to give 13.0V on transmit and 13.4V on receive. T1 is any transformer that will give 16–19V ac out at 2 amps. There are several companies[2] that make such transformers, or a 12.6V and 6.3V filament transformer may be wired in series to give the required voltage. Diodes D1 through D4 form a full-wave bridge rectifier. C1 is a 7000 μF filter capacitor (I used seven 100 μF capacitors in parallel.) Any combination yielding over 6000 μF of capacity should work to remove the ripple from the bridge rectifier. Q1–Q2 form a regulator-filter to regulate the +22 down to +13V. When the transceiver is on transmit, 25W is dissipated in Q1, so be sure to heat-sink it well. Q2 will draw a healthy slug of current under accidental short-circuit of the output, so heat-sink it well also. D5, D6 and the emitter-base junction of Q2 set the output voltage, and they must add up to the desired output voltage (12.0 + .7 + .7 = 13.4V output). R1 is used both as a surge-limiting

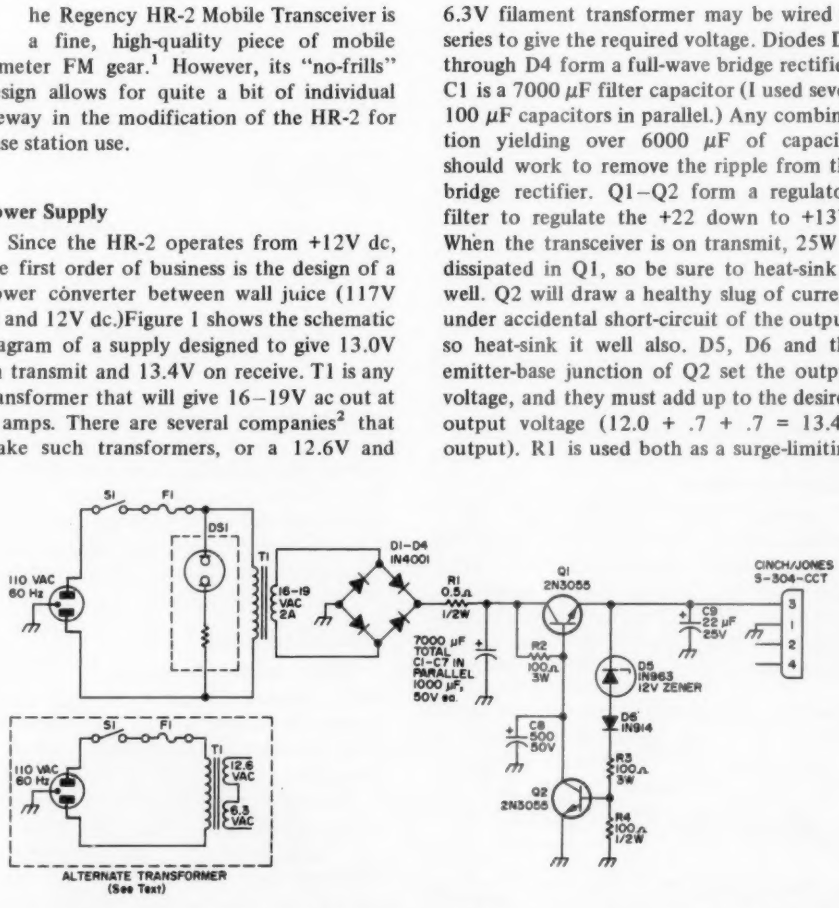

S1
F1
DS1
T1
110 VAC
60 Hz
16–19
VAC
2A
D1–D4
IN4001
R1
0.5Ω
1/2W
7000 μF
TOTAL
C1–C7 IN
PARALLEL
1000 μF,
50V ea.
Q1
2N3055
R2
100Ω
3W
C8
500
50V
Q2
2N3055
D5
IN963
12V ZENER
D6
IN914
R3
100Ω
3W
R4
100Ω
1/2W
C9
22 μF
25V
CINCH/JONES
S-304-CCT
3
1
2
4
S1
F1
T1
110 VAC
60 Hz
12.6
VAC
6.3
VAC
ALTERNATE TRANSFORMER
(See Text)

Fig. 1. Ac power supply. Parts data –C1–C7: 1000μF 50V dc; C8: 500μF 50V dc; C9: 22μF 25V dc; D1–D4: IN4001 50 piv lamp; D5: IN963 zener diode, 12V; D6: IN914 silicon diode; I1: neon panel lamp assembly; F1: 1A slo-blow fuse; Q1–Q2: 2N3448 or 2N3055; R1: 0.5Ω ½W; R2–R3: 100Ω3W; R4: 100Ω ½W; T1: 117V – 16 to 19V at 2A.

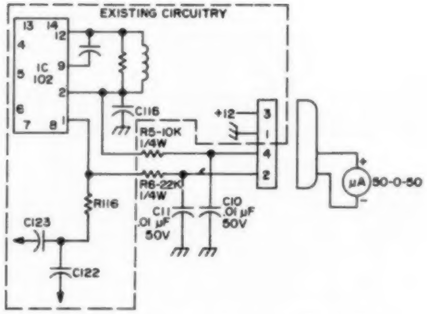

EXISTING CIRCUITRY
IC 102
C116
+12
R5-10K 1/4W
R6-22K 1/4W
R116
C11 .01 µF 50V
C10 .01 µF 50V
C123
C122
µA
50-0-50

Fig. 2. Installation of zeroing meter. Parts data – R5: 10 kΩ ¼W; R6: 22 kΩ ¼W; C10–11: .01 µF 50V dc; M1: 50- 0 - 50 µA panel meter.

resistor and as a current-sensing resistor to be used later. Do not use a lower valve for C8 than 500 µF, or the supply may oscillate and self-destruct Q1 and Q2. Power connections are made to pins 1 (ground) and 3 (+12) of a female 4-pin Jones plug (note – the instruction manual shows pin 1 to be +12 and pin 3 to be ground – it might be wise to check the internal wiring of your HR-2 before you hook up the power cable. Mine was wired the opposite from the manual.) The extra pins (2 and 4 of the Jones power plug) will be used later as output to the zero-center meter.

Zero-Center Meter

Another "frill" useful as a base station accessory is a meter in the discriminator circuit to detect the relative error of other stations or for "zeroing" another transmitter frequency. Figure 2 shows how this modification is accomplished. IC 102 is the original discriminator, with output at pin 1. Pin 2 is a constant dc voltage representing zero frequency error. Pin 1 varies about this voltage plus or minus depending on whether the received frequency is high or low. Decoupling filters R5-C10 and R6-C11 provide the necessary isolation and meter multiplication for a full-scale deflection of M1 at ±25 kHz frequency error.

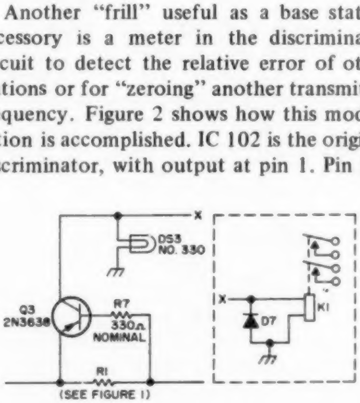

X
DS3 NO. 330
Q3 2N3638
R7 330Ω NOMINAL
R1
(SEE FIGURE 1)
X
D7
K1

Fig. 3. "Transmitter On" light modification. Parts data – D7: 1N4001 diode; I2: 12V pilot bulb; Q3: DNP 2N3638; R7: 330Ω ¼W nominal (see text); RL1: 12V relay.

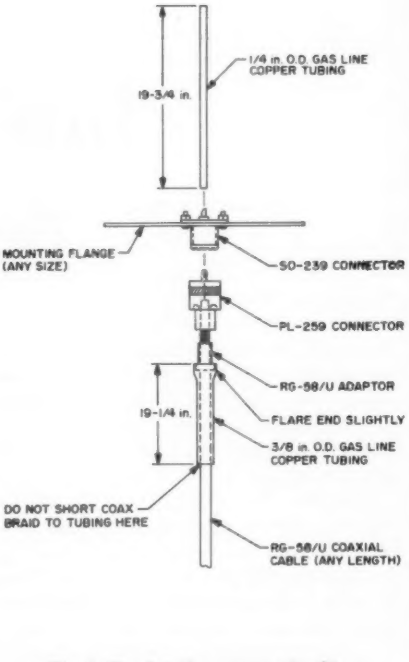

1/4 in. O.D. GAS LINE COPPER TUBING
19-3/4 in.
MOUNTING FLANGE (ANY SIZE)
SO-239 CONNECTOR
PL-259 CONNECTOR
RG-58/U ADAPTOR
19-1/4 in.
FLARE END SLIGHTLY
3/8 in. O.D. GAS LINE COPPER TUBING
DO NOT SHORT COAX BRAID TO TUBING HERE
RG-58/U COAXIAL CABLE (ANY LENGTH)

Fig. 4. Fixed station antenna for $1.

Transmit Indicator

Under certain circumstances, a "transmit" indicator is useful. It may prevent inadvertent keying of the transmitter or a stuck microphone button putting out unwanted A1 emissions.

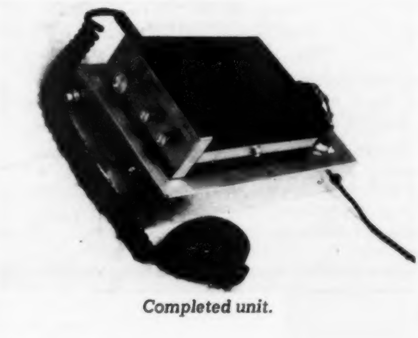
Figure 3 shows the addition of the 3 parts to the power supply for this "transmitter on" light. When the current through R1 increases above an ampere or so, Q3 is turned "on," and provides current to lamp I2. The current through the lamp is set by R7 to give a normal, above normal, or less than normal brilliance. Q3 is thermally adequate for the most normal operations, but you may wish to heat-sink the device or use a heftier device if you are particularly long-winded. A 12V relay (shown on the schematic inset) may be substituted in place of the light to control other functions, such as +12 to an external power amplifier, a 110V light bulb, or other "power" devices.

Antenna

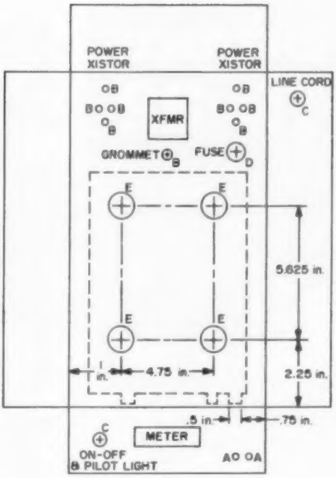
Since the use of the transceiver as a base station is an off-and-on thing, no great pains were taken to make the ultimate in gain or match with the base antenna. Figure 4 shows how a dollar's worth of goodies (except cable) makes a fairly respectable antenna with a resaonble vswr (less than 1.5:1) across the 146–147 MHz band (less than 2:1 from 144–148 MHz). Tuning is non-critical, and the gain is slightly superior to the more complex groundplane[3]. The basic construction is that of a coaxial sleeve monopole. One-eighth in. copper gas line is used for the radiating element and 3/8 in. gas line is used for the sleeve. These lines are available at your local auto parts house or "do-it-yourself" handyman shop for about 25¢ a foot. The SO239–PL259 are standard items at the local surplus shop or radio parts shop.

Construction

The photograph shows the completed base station. A 7x2x13 in. chassis was selected so that the transceiver could be set on it to form the base plate. The power supply components are mounted in back of the transceiver on the chassis, and the underneath of the chassis is almost entirely taken up by filter capacitors. Figure 5 shows the drilling template I used to drill and punch the chassis.



Completed unit.



HOLE CHART		
SYM	SIZE (DIA)	QTY
A	1/8 in.	2
B	1/4 in.	9
C	3/8 in.	2
D	1/2 in.	1
E		4

Fig. 5. Drilling template for home station adaptor.

Layout and parts placement may vary widely from my design; there are no critical parts placement problems with a dc power supply such as this one. However, keep C8 close to the base of Q1 to avoid the aforementioned stability problems.

Final Test

Before plugging the transceiver in, load the power supply output with a 10Ω 10W resistor and measure the dc voltage. It should be 13V ± the tolerance of your zener. No load voltage should be 13.4V ± the tolerance. A final check of the antenna vswr, and your excellent mobile rig is now an excellent base station also.

. . .WB6BHI

References:

1. "Regency: An FM Late Starter," Sessions K6MVH, 73 Magazine, p.96, December 1970.
2. Triad F6OU ($7.68), Stancor RT-201 ($7.40).
3. "Brew 1 on 2," Robinson WA0RWQ/6, 73 Magazine, p.86, September 1970.

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GENERAL • Freq. coverage: 144-148 MHz • 12 channels, 3 supplied • Push-to-talk Xmit • AC drain: Rcv, 6W; Xmit, 50 W • DC drain: Rcv, 0.5A; Xmit, 4A • Built-in Power Supply: AC, 117V 50-60 Hz; DC, 13.5V±10% • Size: 7-7/8" x 2-3/4" x 10-1/4", 8-1/4 lbs.

TRANSMITTER: • Transistorized with 6360 output tube • RF Output: over 10 W • Freq. Dev: Adj. to 15 kHz max. • Freq. Stability: ±.001% or less • Output Imped: 50 ohms.

RECEIVER: • Completely transistorized, crystal-controlled superhet • Intermed. Freq: 1st 10.7 MHz, 2nd 455 kHz • Input Imped: 50 to 75 ohms • Sensitivity: 0.5μV or less/20 dB quieting; 1μV or less/30 dB S+N/N at 10 kHz dev., 1 kHz mod. • Audio Output, 0.5 W • Spurious Sens., > −60 dB.

Including transceiver, 3 channels supplied, mobile mount, dynamic mike and built-in AC-DC power supply.

$299.95 Amateur Net

Accessory BBLT-144D Antenna: Hustler 3.4 dB gain $27.95

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1972 REPEATER LIST

The entries in this list are correct as nearly as we can manage right down to press time for this issue. Between indifference on the part of repeater managers and clubs toward getting their repeaters listed, a daily change in channels and the appearance of new repeaters on an almost daily basis, no list can ever be perfect. The list presented here is by far the most up to date available anywhere . . . and you merely have to keep tab on the repeater update column in the monthly 73 newspages to keep this list in near-perfect shape.

We ask that you take it upon yourself to let us know at 73 if you find any errors in the listings presented . . . or if you hear of any repeaters coming on the air that we do not have listed . . . or any changing frequencies . . . or going off the air. Send us a card, a QSL, a note, a letter, or even a radiogram via the traffic nets . . . but send. The more accurate we can keep this list the more valuable it will be to everyone . . . and the more fun we will all have with FM . . . the Fun Mode.

Repeater access methods are listed so: T1.95 means tone burst, 1950 Hz; W1.7, whistle-on center frequency 1700 Hz; TT, touchtone access (consult repeater club for access code); PL, private line (consult repeater club for exact frequency or reed number). Frequencies are listed so: figures in the last column (e.g., 34–94) refer to the 146 MHz segment of the two meter band. If different segments are used in the input or output or both, frequencies are listed with UHF, six meter, ten meter or 220 MHz frequencies.

ALABAMA

WA4AHX	Albertville			34–94
				20–76
WB4QEX	Birmingham			34–94
W4ZBA	Demopolis W1.8			34–94
	W1.8	52.76	52.525	
		440.00	449.00	
K4SPP	Green Mt.	146.94	147.54	
K4IQU	Huntsville T			46–94
WB4QEV	Mobile			34–94
W4JNB	Muscle Shoals			34–94
WB4QFR	Phenix City W1.8			28–88

ALASKA

—	Anchorage			34–94
—	Nome			34–94

ARIZONA

WA7HUH	Globe CLOSED			
WA7KUM	Globe CLOSED			
K7ZMA	Kingman			34–94
WA7CEM	Phoenix			34–94
				16–76
		449.30	445.30	
K7VOR	Phoenix			94–28
W7AJU	Prescott			34–94
				16–76
WA7KYT	Sierra Vista CLOSED			
K7PQI	Tucson			34–94

ARKANSAS

WA5YUT	Ft. Smith			34–94
W5ZF	Hot Springs			29–88
W5DI	Little Rock			34–94

NORTHERN CALIFORNIA

W6CX	Alamo	147.60	147.06	
K6KDU	Auburn CLOSED			
W6TI	Castro Valley	147.96	147.18	
WB6DGJ	Eureka			34–94
WB6QVV	Forest Hills T1.8	51.60	51.00	
WB6HYL	Fresno			34–94
		146.34	52.525	
		52.525	146.94	
W6JPU	Fresno	51.725	51.125	
		146.12	147.71	
		146.85	147.71	
		448.00	449.93	
WA6RDY	Fresno	146.46	147.84	
WA6UGS	Grass Valley T2.25			34–94
WA6ZOF	Kentfield CLOSED			
W6DOO	Los Altos	146.85	147.71	
WB6LJR	Los Gatos CLOSED			
WB6EMJ	Merced			06–76
K6LY	Monterey			37–97
WB6ZOI	North Highland			16–76
WA6RYQ	No. Sacramento			80–20
WB6AAE	Oakland			20–80
	T1.95			94–94
		449.50	444.50	
WB6NDJ	Oakland T	51.70	51.075	
		50.40A	51.07	
WB6QEO	Oakland CLOSED			
K6SWS	Oakland T1.8			34–94
K6YVY	Oroville			34–94
WA6TSM	Palo Alto			13–73
		448.45	443.45	
WA6YCZ	Palo Alto CLOSED			
W6ECE	Paradise	147.00	146.49	
WB6SXC	Petaluma	145.98	146.90	
		448.60	443.60	
K6MIA	Redding	145.22	147.20	
K6QFO	Redwood City T1.8	51.90	51.35	
		146.31A	146.49F	
WB6ZRR	Richmond	146.40	145.47	
W6GDD	Rio Linda			34–94
WA6UGY	Rio Linda CLOSED			
WA6JCW	Sacramento	146.?	UHF	
		51.00	UHF	
K4TXK/6	Sacramento	52.76	52.525	
		52.76	443.00	
		52.525	443.00	
W6AQU	Salinas	146.60	147.60	
WA6BTH	San Bruno	11.90	51.35	
WB6OQS	San Jose T2.4			16–76
		449.60	444.60	
WA6UFE	San Jose			04–52
K6GWE	San Rafael			10–70
		448.25	443.25	
		145.10A	146.70F	
WA6UGM	San Rafael	51.00	51.00	
		51.30	51.30	
WB6IAG	Santa Clara T2.55			34–94
W6AEX	Suisan CLOSED			
WB6WYI	Vacaville T2.1	51.60	51.00	
K6JGE	Watsonville	146.928	147.60	

SOUTHERN CALIFORNIA

K6SYU	Anaheim			52–19
		145.62A	145.49F	
K6APE	Bakersfield T1.7	145.25	146.75	
WA6UJK	Bakersfield	145.155	146.90	
WB6SLR	Blue Ridge	146.94	449.15	
		146.46	449.15	
		146.94	449.475	
		146.46	449.475	
WA6FNT	Crestline			94–94
				76–76
				46–46
				34–34
WB6OPG	Exeter T1.8			16–76
	T2.2	145.20	146.82	
K6SJF	Goleta	146.16	146.995	
WB6ZDI	Hollywood Hills	146.61	147.33	
W6AOE	Idyllwild CLOSED			
W6FNO	Johnstone Peak			82–70
WA6CHZ	La Crescenta	145.15	146.49	
K6CPT	Los Angeles	145.66	145.30	
		147.28A	145.30F	
WA6FLH	Los Angeles	146.22	147.39	
K6MYK	Los Angeles	146.98A	145.22A	
WA6NUD	Los Angeles			34–94
K6ROC	Los Angeles CLOSED	RACES		
WB6TXX	Los Angeles	224.82	221.70	
WA6UJS	Los Angeles	52.76	52.525	
		52.525	449.95	
WA6UPB	Los Angeles	145.17A	147.66A	
		221.94	146.66	
WA6ZOC	Los Angeles	224.82	221.74	
		224.82	146.40	
WB6VYT	Los Angeles	224.82	146.40	
WA6TDD	Mt. Wilson	145.425A	146.40A	
WA6ZNL	Norwalk CLOSED			
WB6GUA	Palmdale T1.8			34–94
WB6ZON	Palos Verdes CLOSED			
WA6URI	Riverside			16–88
WA6LNU	Saddle Peak	221.63	223.00A	
WA6TIC	Saddle Peak RTTY			58–70
WA6ALV	San Bernardino T1.8			34–85
WB6WLV	San Diego T2.1,PL			34–85
		445.25	449.50	
W6SD	San Fernando Vlly	440.50	445.50	
WB6TSO	San Luis Obispo			20–80
K6TAZ	Santa Barbara			34–94
WB6YZV	Santiago Peak CLOSED			
W6FHF	Santiago Peak CLOSED			
WB6ZRQ	Sierra Peak CLOSED			
WA6SIN	Sulfur Mtn. T1.95			28–88

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Frequency ....143-149 MHz (2MHz spread)
Number of channels........................5 Supplied with 146.94 simplex, 146.34/.94 (same plug in crystals as SR-C826M)
R.F. Output.............1 watt minimum
Sensitivity..................better than 0.4 uv/20 DB Q.S.
Audio output.......................500 mw
Meter ......monitors battery voltage on Tx, S Meter on Rx
Current drain ....400 maTx, 15 maRx SBY
Size......8⅝" high x 3" wide, x 1⅝" deep
Weight ....24 oz., less batteries

Options: external mic, or mic-speaker, stubby flexible antenna, desk top charger, leather case.

$279.00

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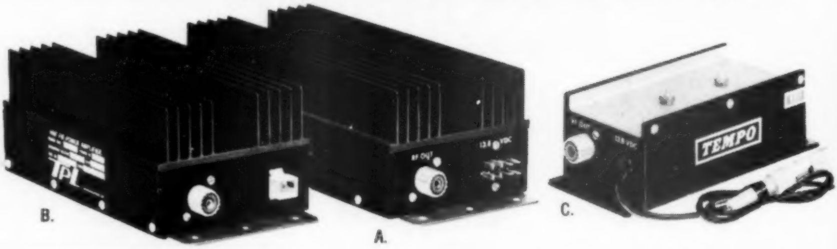

A. TPL802 (80W out)
TPL1002-3 (120W out)

True powerhouses. 10W input gives a guaranteed 80 or 120W output (In fact, typical output runs as high as 140W). Operates directly from a 12 VDC power source. Antenna switching is automatic when as little as 1.5W of RF drive is applied. The amplifier incorporates Balanced Emitter transistors and state of the art design practices, making it virtually immune to destruction due to high VSWR or misloading conditions. Features include THREE 40W output transistors (in the TPL1002-3) plus one 40W driver transistor, low loss input coax connector (complete with RF cable), low loss solid state antenna switch (.5 db or less typical) and Spurious response: −60 db typ. All amps include a built in power output monitor for use with a Remote Control Head and may be used anywhere in the 2 meter band without the necessity of retuning. Only 9⅜" x 4½" x 3", the TPL1002-3 can be installed almost anyplace. Since there are no switches or meters, it may be mounted under a seat, in the trunk or in a desk drawer. Power output: 120W. Input voltage: 13.8 VDC. Current required: 15-17 amps. Drive required: 5-25W for 100-140W out. Price TPL1002-3 $220.00 TPL802 $165.00

B. TPL502

A superior quality VHF FM two meter power amplifier. Only 6½" x 3½" x 3", yet contains all the features of the TPL 1002-3 and provides a minimum of 45W output and typically 50W. Price $99.00

The above amplifiers are completely compatible with the following transceivers: Tempo FMV & FMA / Standard 806, 826 / Regency HR-2 / Rosswhite RWB / Telecom / Drake ML / Comcraft CTR-144 / Simpson Model A / Sonar 3601 / IC20, IC21 / or any other 5-25W XCVR.

Hi-power amps for handi-talkies & 1-3W xcvrs

C. TPL252-A2

Unbelievably small . . . but outperforms many of the big ones. 1-3W input delivers an easy 25W power output. Only $85.00

A. TPL1002-3B (1-3W in/110W out)
TPL802B (1-3W in/80W out)
TPL502B (1-3W in/45W out)

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TPL445-30
(4W in)

TPL445-30B
(1W in)

1 or 4W input . . . minimum 30W output. 450 MHz UHF. Same features . . . same superior quality as TPL 1002-3, including low loss solid state antenna switch. Ideal for use with 1 watt handi-talkie or other low power UHF transceivers.

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MODEL NUMBER	POWER INPUT	POWER OUTPUT (min)	BAND	PRICE
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TPL1002-3B	1-3W	80W	2M	$235.00
TPL802	5W	80W	2M	$165.00
TPL802B	1 to 3W	80W	2M	$180.00
TPL502	5 to 15W	35-55W	2M	$ 99.00
TPL502B	1 to 3W	45W	2M	$125.00
TPL252-A2	1W	25W	2M	$ 85.00
TPL445-10	1 to 2.5W	12W	440MHz	$125.00
TPL445-30	4W	30W	440MHz	$215.00
TPL445-30B	1W	30W	440MHz	$235.00

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The 3 watt portable from Tempo is the fmp. Truly mobile, the fmp gives amateurs 3 watts, or a battery saving ½ watt, FM talk power anyplace at anytime. With a leather carrying case included, this little transceiver will operate in the field, in a car, or a home with an accessory AC power supply. The battery pack is of course included. The price . . . $225.00.

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WA6TTL	Silver Peak			34–94
		52.525	146.94	
		146.94	52.525	
WB6OPH	Visalia	51.336	52.80	

COLORADO

W0IA	Boulder T1.8			16–76
		444.55	449.55	
WB0ERV	Buckhorn			25–85
W0JGL	Castle Rock			07–67
WA0BAG	Colorado Springs			16–76
W0WYX	Colorado Springs			34–94
				16–76
		53.00	52.525	
		444.45	449.45	
WA0NVU	Denver	UHF		
K0OVQ	Denver T1.8	146.82	147.30	
WA0VVC	Denver	444.35	449.35	
WA0VUO	Denver			04–64
W0PRZ	Grand Jct.	145.32	146.94	
WA0SNO	Pueblo			34–94
				28–88
K0PHF	Pueblo			28–88

CONNECTICUT

WA1KHK	Avon			28–88
WA1JTB	Bridgeport			31–88
W1NHK	Columbia (CD)	145.47	147.09	
WA1KGB	Farmington			37 -97
K1IGF	Groton			19–94
WA1NQP	Naugatuck	444.2	449.2	
WA1KGD	New Haven			01–61
W1CDO	Ridgefield	441.85	446.85	
WA1KGK	Trumbull			16–76
W1CH	Torrington	443.80	448.80	
WA1KHA	Torrington			25–85
WA1KGQ	Vernon			19–79
		52.76	52.525	
		443.3	448.3	

DELAWARE

K3SVA	Delmar			22–82

FLORIDA

WB4KVV	Boca Raton T			34–76
W4IKB	Chipley			34–94
W4AB	Ft. Lauderdale			22–82
WB4EQU	Ft. Walton Beach W1.8	29.44	29.64	
WB4KLT	Ft. Walton Beach T1.8			34–76
WB4KNQ	Merritt Island			28–88
		443.10	448.10	
WB4HAA	Miami			34–76
		448.20	146.76	
WB4GLK	Okeechobee			34–94
				94–76
WB4QEL	Orlando			34–76
WB4QER	Panama City W2.0			34–76
WB4QEQ	Pensacola T2.2			34–76
WB4IES	St. Petersburg CLOSED			
—	Starke			34–94
—	Tallahassee			34–76
WB4HAE	Tampa			34–76
		448.20	146.76	
WB4QEN	Tampa	441.10	449.10	

GEORGIA

W4BOC	Atlanta T1.8			34–76
W4DOC	Atlanta			22–82
WB4NST	Atlanta CLOSED			
WB4KLM	Augusta			34–94
W4VO	Rome W			34–94
				46–94
W4RRW	Smyrna			28–88

HAWAII

KH6EQF	Honolulu			20–80
		52.525	53.52	
		449.15	444.15	
KH6EQR	Lualualei			16–94
KH6EQK	Mt. Haleakala			34–94
KH6EQL	Waialua			20–80
KH6FOX	Waikiki			16–76
KH6NLH	Waipahu			16–76

IDAHO

K7ZZL	Deer Point			34–94
—	Orofino			34–94

ILLINOIS

WA9EAW	Aurora CLOSED			
WA9WVA	Batavia CLOSED			
WA9GCK	Bloomington			22–94
WA9DZO	Chicago PL			10–85
WA9DZT	Chicago T1.8	52.76	52.64	
WA9EAP	Chicago	Mobile 147.45	147.75	
		Base 147.50	147.75	
WA9ORC	Chicago			16–76
—	Chicago	147.40	147.81	
—	Cnicago T1.8			34–88
W9MJL	Danville			22–82
WA9TEC	Decatur W2.2	146.34	449.60	
		449.60	146.90	
	W1.5	146.28	449.60	
		449.60	146.88	
WB9ADW	Genoa			13–76
WA9SGJ	Graymont			16–94
WA9EAT	Joliet	146.28	146.987	
WA9EAE	Oak Lawn CLOSED			
WB9AEF	Peoria			34–76
WA9EAM	Petersburg			34–94
W9FBS	Rockford			82–94
W9DGV	Rock Island T1.8			34–94
				34–76
W9YIY	Troy			16–76
WA9WVB	Urbana			34–76
WA9LIV	Waukeegan	145.95	146.55	
WB9HWS	Western Springs T2.0			04–64
K9CLW	Winnebago CLOSED			

INDIANA

WA9WVC	Anderson			22–82
W9ZPP	Evansville	52.92	52.575	
WA9EAU	Ft. Wayne			34–76
				34–94
				28–76
W9INX	Ft. Wayne			28–88
		52.68	53.88	
WA9HRK	Indianapolis			46–88
K9LEH	Indianapolis			34–76
K9JSI	La Porte			22–82
W9CSF	Michigan City T1.8 or PL			31–97
K9SJI	Muncie T1.7			34–76
WB9ADO	Schereville CLOSED			
W9EHZ	Schereville			34–91

IOWA

WA0VVA	Cedar Rapids T2.0			34–94
		146.34	445.52	
		445.52	146.94	
WA0VVD	Council Bluffs			22–82
K0IXR	Des Moines W1.2			34–94
WA0SNS	Waterloo			34–94

KANSAS

WA0AMR	Kansas City			34–94
		52.70	52.525	
K0OKI	Kansas City	52.88	52.525	
		448.10	449.10	

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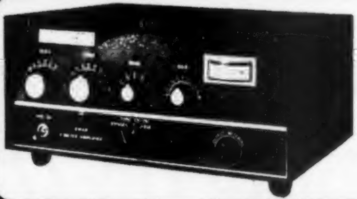
JUGE

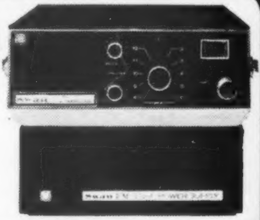


2 METER "BLOCKBUSTER"

180W P.E.P. SSB ● 150W DC input AM-FM uses a 5894B twin tetrode ● Built-in AC supply – operate DC with Swan's Model 14C DC converter. Identical size and styling to Swan's SSB transceivers. Built-in antenna relay. Swan VHF-150 **$279.00**

14C DC Converter **$65.00**

new Swan FM 1210-A



INDEPENDENT SELECTION

of 12 transmit and 12 receive channels

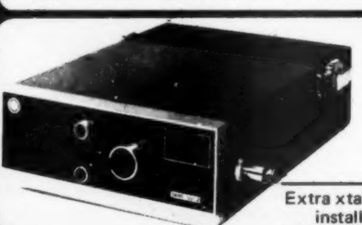
Comes with transmit – .22, .34, .76 and .94

receive – .28, .88, .76 and .94

Includes microphone, DC cord, AC supply.

AVAILABLE NOW............... **$329**

SWAN FM-2X



Extra xtals $3.95 ea installed free

10 watts output ● 12 channels

Snap-on-the-back AC supply

"Broadcast Quality" audio

A truly outstanding value

$259

"FACTORY-DIRECT" CASH PRICES
24 HOUR SHIPMENT
WE HONOR SWAN CREDIT PLAN
ENTIRE SWAN LINE IN STOCK

Send your check or money order or call in your order. Our phone is answered after hours automatically for your convenience. Call at night – cheaper rates.

ED JUGE ELECTRONICS, INC.

3850 SOUTH FREEWAY
FORT WORTH, TEXAS 76110

Phone (817) 926-5221

Hours: 9–5:30 Tues. thru Sat.

JUGE

73 MAGAZINE FM ISSUE

— SPECIAL —

A JUGE EXCLUSIVE 1 YEAR WARRANTY

THIS MONTH ONLY . . . ON ALL SALES OF NEW FM EQUIPMENT DURING THE 73 MAGAZINE FM MONTH, JUGE ELECTRONICS WILL GIVE A FULL ONE-YEAR WARRANTY, WITH THREE OPTIONS:

1. We will repair in our shop free of charge, any defective unit returned to us freight prepaid.
2. Send your unit to the factory, prepaid, we'll pay their bill.
3. Have it repaired locally, send us the defective parts, and we will replace them to you. Sorry, we won't pay local labor charges.

Place your order today. Please send cashier's check or money order . . . for COD include 10% deposit. Mastercharge or Bankamericard accepted (send card number and expiration date. On Mastercharge send small "interbank" number shown above your name.) All in-stock items shipped the day your order reaches us.

Drake TR-22 6-channel transceiver	$199.95
MMK-22 mounting bracket for TR-22	6.95
AA-22 Xmit/Receive amp for TR-22	149.95
ML-2F Marker Luxury 12-channels	329.95
Dy-Comm "C" amplifier	$59.95
"D" 10W in, 40–50 watts output	99.95
'E" 1–3W in, 20–30 watts output	79.95
"ES" 1–3W in, 40–50 watts output	99.95
"10-0" 10W in, 90–120 watts output	195.00
Power supply runs 10–0 on AC	75.00
Crystals for Swan, Regency, Drake, Tempo	3.95

Regency HR-2A 15 watts out	$229.00
HR-2S base transcan	349.00
HR-2MS mobile transcan	319.00
Standard SRC-826M12-channels	$339.95
SRC-146 "talkie"	279.95
Swan	see opposite page for prices
Tempo FMA	$349.00
Tempo FMP	225.00
Tempo FMV	249.00

Our own 4 Amp unregulated power supply for any above 10 or 15 watt rig. $19.95

"JUGE" rhymes with "huge," and that's the way we'd like to think of our service. We've been in the Amateur business now for eight years, and have built our reputation for service and assistance to our customers. Take advantage of this unusual offer . . . we bet you'll become a regular Juge customer.

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3850 SOUTH FREEWAY
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Phone: (817) 926-5221

Hours: 9:00–5:30 Tues. thru Sat.

WA0VVW	Pittsburg			34–94
WA0CJQ	Salina			34–94
WA0SNP	Topeka			34–94
W0DKU	Wichita			34–94
W0IPB	Wichita			22–82

KENTUCKY

W4MOP	Louisville			34–94
WB4RYX	Louisville			46–88
K4UCS	Owensboro			34–94

LOUISIANA

WA5MZZ	Alexandria			34–94
WA5ZHD	Baton Rouge			34–94
W5WN	Lake Charles			34–94
WB5CDP	Monroe	52.827	52.525	
W5MLE	Morgan City			34–94
		440.00	146.94	
		444.50	52.525	
WB5AEG	New Orleans	444.20	449.20	
W5UK	New Orleans W1.8			34–94

MAINE

W1QXR	Bangor			34–94
WA1KGP	Sanford			13–73
WA1KGZ	Buckfield (Streaked Mt.)			34–94

MARYLAND

WA3DZD	Baltimore			22–82
				34–76
		448.10	449.10	
K3MDX	Baltimore	146.91	147.33	
WA3KWG	Cheverly			01–61
W3IJF	Frederick			13–73
WA3PPN	Havre de Grace			25–85
WA3BMM	Rockville	53.25	52.68	
		52.80	52.68	
K3SVA	Salisbury			22–82
WA3PJQ	Severn	146.46	147.06	
WA3CJD	Silver Spring	52.76	52.565	
WA3JCN	Silver Spring	448.00	449.00	
WA3PVO	Silver Spring			19–67
WA3PVP	Wheaton			07–67
		223.30	224.30	
		448.30	449.30	

MASSACHUSETTS

K1JMR	Boston	444.95	449.95	
WA1KEQ	Cape Cod			07–67
W1RGG	Fall River			28–88
W1VAK	Falmouth			34–94
K1AIU	Framingham			34–94
WA1KGR	Holyoke			34–94
W1QFD	Marlboro	147.03	147.87	
K1FFK	Mt. Greylock			31–91
		52.76	52.56	
K1AOI	Oxford TT			28–88
W1CSF	Pelham			13–73
W1BL	Princeton	53.345	50.50	
W1RJS	Salem			28–88
WA1MHN	Somerville			07–67
WA1KGS	Waltham			04–64
		444.05	449.05	
W1MTV	Westfield			10–70
W1HWK	Weston			22–82
WA1KRJ	Worcester			37–97

MICHIGAN

WB8CSC	Ann Arbor			37–97
WB8CSA	Benton Harbor T2.4			34–94
W8MAI	Benton Harbor			22–82
WA8BDD	Clarkston			31–85
WB8COS	Detroit			34–76
WB8CRK	Detroit	449.00	444,00	
K8VLN	Detroit			46–64
WB8CRW	East Tawas			34–94
WA8PUD	Grand Rapids T2.4			34–94
K8TIW	Kalamazoo T2.1			34–94
WB8CQM	Lansing			34–94
K8WNJ	Muskegon			22–82
K8TJP	Trenton	437.90	442.90	
		433.70	432.90	
K8WKE	Utica			28–91

MINNESOTA

—	Duluth			34–94
K0RTU	Elk River T1.8			34–94
WA0SSN	Faribault			16–76
WA0JCX	Minneapolis			28–88
W0CKF	Minneapolis			94–46
		53.64	146.46	
		146.94	53.64	
W0PZT	Minneapolis			34–46
WA0CQG	Rochester			94–46
K0LAV	St. Paul W1.4			34–94
WA0NPZ	St. Paul	146.58	147.03	
K0PML	St. Paul			34–76
K0PMU	St. Paul T.18			16–76
W0UGR	Waseca			94–46
				34–94
WA0CJU	Waseca			34–94
—	Wilmar			34–94

MISSISSIPPI

K5TYP	Biloxi T2.0			34–94
WA5RMS	Gautier T2.4			34–94

MISSOURI

WA0AMR	Kansas City			16–76
K0FRA	Kansas City	52.70	52.525	
WA0TEG	Kansas City	52.88	52.525	
WA0VUN	Kansas City			22–82
WA0VVB	Kansas City			34–94
W0OKB	Savannah			10–94
WA0VVV	Springfield			34–94
WA0CJW	St. Louis			34–94
K0RWU	St. Louis	52.05	51.25	
		441.56	51.25	

MONTANA

W7YB	Bozeman			34–94
WA7KZF	Butte			34–94
		448.15	449.15	
WA7QAA	Great Falls			34–94

NEBRASKA

WA0MFC	Lincoln			34–94
K0YRL	N. Platte			34–94
W0EQU	Omaha			34–94

NEVADA

W7AKE	Las Vegas			20–80
		147.18	147.84	
		53.39	147.84	
	T			34–94
WA7HXO	Las Vegas			40–94
K7UGE	Las Vegas			34–94

Professional Quality for the Professional Amateur!

AMATEUR—2 meters TRANSMITTER-RECEIVER

(from 144 to 148 MHz)

COMPLETE FLEXIBILITY FOR MOBILE — BASE — HAND HELD PORTABLE

NARROW BANDER
MODEL FM 3601
Sonar
2 METERS
1
2
3
4
5
6
7
8
TRANSMIT
POWER
SQUELCH
VOLUME

Model FM 3601 (2 METER)

• 8 Channels with Instant Push Button switching • 10 Watts • Solid State. Finest quality silicon transistors • Netting trimmer for each receive and transmit crystal • High quality mechanical filter for adjacent channel rejection • Military-grade, glass-epoxy printed circuits • Rugged, serviceable design, compact construction • Diode protected Dual-gate FET mixer • 25 transistors, 1 IC, 1 MosFet, 16 Diodes • Overload protected receiver R.F. stage

$299⁹⁵

Complete with microphone, mobile mounting tray and 2 pair of crystals. (146.94T/146.94R and 146.34T/146.94R)

Model PS-2923 AC Regulated Power Supply $39.95

SPECIFICATIONS

Frequency Coverage: 144—148 MHz
Dimensions: 6¾"W x 2⅝"H x 9"D without tray
Weight: 5 lbs.
Microphone: Controlled Magnetic
Antenna Impedance: 50 ohms

RECEIVER
Sensitivity: At least 0.5 μV for 20 db Quieting.
0.35 μV for 12 db Sinad
Selectivity: 16 KHz @ 3 db
Freq. Tolerance: .001% from −30°C to 60°C
Spurious Rejection: At least 60 db
Audio Power: 2 W. w/less than 10% distortion
Squelch Range: 0.2—0.8 μV
Intermediate Freq.: 10.7 MHz & 455 KHz

TRANSMITTER
Emission: 16F3 (Frequency-Modulated)
Freq. Tolerance: .0005% from −30°C to 60°C
RF Power Output: 10 Watts
Spurious & Harmonic Attenuation:
More than 50 db below RF carrier
Deviation: Internally adjustable 0—10 KHz

POWER REQUIREMENTS
Receive: Squelch standy: 0.175 Amp.
Maximum audio: 0.500 Amp.
Transmit: 1.90 Amperes
Voltage: 13.8 VDC—Neg. Ground only

Sonar
VHF TRANSCEIVER MODEL 2307

Plastic Case

MIN.
1.6 WATTS
OUTPUT

Model 2307 VHF-FM (144-148 MHz) TRANSCEIVER 5 CHANNELS HAND HELD PORTABLE

• Provides immediate voice contact with Base Stations, Mobile Units and other portable transceivers • Compatible with ALL 2-way communications systems • Snap-in Nicad Battery Pack cartridge • Receiver and transmitter can be operated on independent frequencies • Electronic mode switching/no relays • Receiver and transmitter sections are individual modules for easy servicing • Sensitive adjustable squelch • Sensitive, noise immune squelch • Meets all EIA requirements.

$450 complete with collapsible antenna and shoulder strap.
Less crystals & battery cartridge*

SPECIFICATIONS

Frequency Range: 144-148 MHz
Power Supply: Snap-In Nicad Battery Pack
Power Drain: Standby—10 ma
Receive—50 ma
Transmit—450 ma
Battery Life: 8-14 hours
Quick Charge: with 3 hours
Dimensions: 3¼"W x 9"H x 2"D
Weight: 1½ lbs.

TRANSMITTER
Power Output: 1.6 Watts
Modulation: ±5 KHz
Stability −30°C to +60°C: ±0.0005%
Spurious & Harmonics: 46 db
FM Noise @ ±3.3 KHz deviation: 46 db
Audio Distortion: 10%
Audio Response (EIA): 6 db per octave
pre-emphasis from 300 Hz to 3 KHz

RECEIVER
Sensitivity: 12 db Sinad—0.35 microvolts
20 db Quieting—0.50 microvolts
Modulation Acceptance: ±5 KHz
Spurious & Attenuation: 70 db
Squelch Sensitivity: 0.15 microvolts
Audio Output 65 ohm: 250 milliwatts
Stability −30°C to +60°C: ±0.0005%
Selectivity Adj. Chan.: 85 db
Channel Spacing: 30 KHz

SONAR RADIO CORPORATION

73 Wortman Ave., Brooklyn, N.Y. 11207

SBE

Been denying yourself all that great fun so many other amateurs are having with their rock-solid, through-the-repeater contacts?

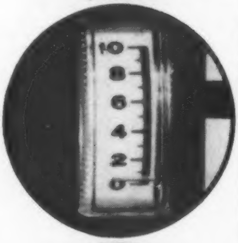
Delay no longer! Hasten to your SBE dealer. Verify that the brilliant new **SB-144** has more channels---greater power output ---starts your enjoyment **now** by including three sets of crystals on popular repeater frequencies and a high quality, SBE exclusive dynamic microphone **without extra charge.** Add a sizzling, double-conversion receiver and a combo "S" and output meter with big **lighted** scale that also saves your battery by showing when the transceiver is ON.

Confirm the price then make the deal. Lose no time in securing this book-size beauty under your dash with the tiltable mounting bracket supplied. Then, **power on! ENJOY!**

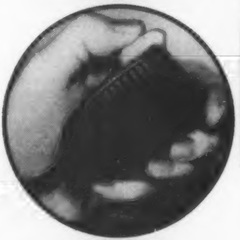
SB-144 2 meter FM TRANSCEIVER

12 CHANNELS. BACK LIGHTED NUMBERS

SUPPLIED WITH 3 SETS OF CRYSTALS



LARGE SCALE METER, COMBO, "S"/OUTPUT



SUPPLIED WITH DYNAMIC MIC.

IN STOCK

AT FRECK

for

immediate

delivery

239.95

BEFORE YOU TRADE – TRY US!

Bank Americard – Master Charge
Two points to serve you

FRECK RADIO SUPPLY

Serving the area since 1928

Tenny Freck W4WL
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Sandy Jackson – Mgr.
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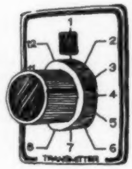
Bill Ingram – Mgr.
3008 Spring Garden
Greensboro, N.C.
(919) 294-2311

the new Swan FM 1210-A

IN STOCK AT FRECK

for immediate delivery

Swan
Swan FM 1210-A POWER SUPPLY



FM 1210-A SPECIFICATIONS

- Frequency coverage 144–148 mc.
- Number of channels: 144 (12 rcv, 12 xmt, independent switching).
- 8 crystals are included as follows: TRANSMIT: 146.22, 146.34, 146.76, 146.94. RECEIVE: 156.28, 146.88, 146.76, 146.94.
- Modulation: frequency modulation (phase type).
- Transmitter control: push to talk on microphone.
- Power source: AC 117 volts 50-60 cycles, DC 13.5 volts ±10%.
- Dimensions: 8¼" x 7" x 3".
- Weight: 8¼ lbs.
- Furnished with unit: dynamic microphone, antenna connector plug, spare fuses and lamps, AC power supply, DC power cord, and mobile mounting bracket.

Transmitter

- Fully solid state, no tubes.
- RF output power: 10 watts nominal.
- Frequency deviation: phase type, factory adjusted to 5 kHz.
- Frequency stability: ±.001%, –30° to +50°C, oven controlled.
- Spurious & harmonic radiation: –60 db minimum.
- Frequency multiplication: 12.

Receiver

- Type: superheterodyne, dual conversion 16.9 mHz and 455 kHz IF.
- Input impedance: 50 to 75 ohms.
- Sensitivity: 0.5 uv for 20 db quieting. 0.25 mv for 12 db SINAD.
- Intermodulation: greater than 55 db.
- Audio output: 2 watts at less than 10% distortion.
- Image response: –55 db.
- Squelch threshold: less than 0.3 mv.
- Adjacent channel rejection: --55 db.

Swan adds another dimension to 2 meter FM operation. Now with Swan's new independent switching for transmit and receive tuning (shown at right), combined with capacity for 12 receive and 12 transmit crystals, the FM 1210-A provides the capability for 144 channel combinations. With this wide selection of channels, crowded frequencies and unwanted QRM are virtually eliminated.

Selectivity has been greatly improved with the addition of our 16.9 mc crystal lattice filter that provides substantially greater rejection of adjacent channel interference. Extensive testing has shown that the new Swan 1210-A has selectivity equal to any 2 meter transceiver on the market, at any price.

The power of the FM 1210-A is rated at 10 watts output which, with the proper antenna, provides you with reliable communications. The output transistor is protected against damage from an improper load by an automatic protection circuit.

Each crystal has its own trimmer capacitor for exact frequency adjustment. In addition, the FM-1210-A is the ONLY 2 meter transceiver to provide a crystal oven for superior stability on those cold mornings.

Receiver audio to internal speaker is rated at 2 watts, almost twice that of most other 2 meter units, for loud clear reception of the station you are working. Provision has been made for the addition of an external speaker, and there is external keying for an amplifier.

As little as $10 per mo. on Swan's new Revolving Credit Service thru Freck.
$26 down, $10 mo. on unpaid balance. Annual percentage rate 18%.

BEFORE YOU TRADE – TRY US!
Bank Americard – Master Charge

FRECK RADIO SUPPLY

Two points to serve you

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Serving the area since 1928

W7CX	Reno	147.85	UHF	
		UHF	146.20	
WA7NHV	Reno			34–94
		147.00	146.94	
K7TNU	Reno	146.94	51.60	
		51.0	146.94	
K7UGT	Reno T2.4	146.94	147.48	
				34–94
K7VJZ	Reno	146.94	52.525	
		52.525	146.94	

NEW HAMPSHIRE

W1ALE	Concord			34–94
	Except 1st 3 min. of each 15:			
		146.46	146.94	
		146.46	52.525	
		52.525	146.94	
K1MNS	Derry			25–85
WA1KFV	Manchester CLOSED			
WA1KGO	Peterborough			19–79
WA1KGU	Salem			37–97

NEW JERSEY

W2KUU	Camden			25–85
W2BHK	Cherry Hill			22–82
K2IEZ	Fords	447.40	449.40	
WA2UWC	Greenbrook			34–94
				37–97
WB2KKO	Oakland			16–91
WA2UWR	Paramus PL 4A 141.3 Hz			19–79
		449.10	448.10	
K2GE	Sayerville			16–46
W2FLY	South Jersey			22–82
K2TYV/2	Split Rock			40–97
		444.9	449.9	
		146.4	449.9	
		444.9	146.97	
WA2ZVQ	Toms River			31–91
W2SJT	Washington			22–82
WA2PRI	W. Orange	443.25	448.25	
K2ODP	Woodbridge PL			22–82

NEW MEXICO

WA5KUI	Alamagordo			34–94
K5CQH	Albuquerque	146.46	147.06	
WA5JDZ	Albuquerque			34–94
WA5OIP	Albuquerque			25–88
WA5QXB	Albuquerque	146.40	147.00	
WA5QLZ	Albuquerque			28–88
	Las Cruces			34–94
		146.46	147.06	
W5PDO	Los Alamos			34–94
WA5YTG	Portales			34–94
WA5DMQ	Roswell			34–94
K5SFB	Sandia Crest	448.60	443.60	
WA5VKY	Sandia Crest	146.46	147.06	
WA5YTK	Sierra Blanca	145.50	146.50	

NEW YORK

W2DRZ	Bath			58–94
WA2CKW	Birch Hill	145.20	147.12	
K2LDT	Boston			31–91
				34–94
W2TFJ	Brookhaven	53.60	146.82	
		50.74	146.82	
K2KDA	Brooklyn	441.55	446.55	
WB2TLJ	Buffalo			31–91
		On request		34–94
WA2UYO	Cherry Creek			31–91
		146.34	146.147	
W2SB	Dunkirk			34–94
WA2UYI	Farmingdale LI	441.75	446.75	
WA2UYJ	Gore Mt.	441.15	446.15	
W3DEG	Grafton			22–76
K2KDA	Hemostead LI	441.70	446.70	
W2GHR	Hunter Mt.			28–88
				28–91
				28–85
WA2PDJ	Huntington LI			25–85
WA2UZE	Huntington LI			52–76
WA2BXK	Hyde Park	441.00	446.00	
W2CXM	Ithaca			34–94
WA2UWK	Jamestown			34–94
				28–88
W2WJS	Long Island	441.65	446.65	
WA2UYP	Mt. Beacon	441.15	446.15	
W2OQI	Manorville LI T			34–82
		146.34	147.12	
WA2UVX	Millbrook	147.00	147.69	
WA2SUR	New York City			13–73
K2UHD	New York City	147.12	147.68	
WA2INM	New York City	146.205	146.805	
K2KDA	Plainview LI	441.80	446.80	
W2CVT	Poughkeepsie			37–97
		441.15	446.15	
WA2UWQ	Rochester			28–88
W2IBW	Rockland Cty CLOSED UHF			
K2AE	Schenectady			46–94
WA2YYQ	Staten Island			28–88
WA2YZZ	Staten Island RTTY	449.25	146.70	
WA2UWF	Syracuse			46–94
		53.75	52.64	
K2DHH	Troy	53.75	52.58	
WB2NNZ	Troy			34–94
		53.75	52.58	
K2GVI	Utica			34–94
WA2UWS	Utica			28–88
K2AVP	Westchester	146.46	147.06	
		(CD) 15		
		(CD)145.68	147.06	
WA2UYJ	Whiteface Mt.			22–82
K2LJC	Woodmere LI			04–64
WB2BLQ	Yonkers PL4A	31–91		

NORTH CAROLINA

WA4NUO	Asheville			34–94
WA4UMH	Beulaville			34–94
K4RSH	Chapel Hill			22–82
	Charlotte			16–76
W4BFB	Charlotte			34–94
WB4QFT	Durham	444.25	449.10	
K4RUQ	Durham W			34–94
WA4VTX	Elizabeth City			28–88
W4NBR	Goldsboro/Kinston			16–76
WB4OFF	Greensboro			16–76
K4VUG	High Point			34–94
W4PAR	Lexington			31–91
—	Mt. Airy			38–98
WB4NXE	McCain	52.525	146.05	
		52.78	52.525	
		146.42	52.525	
W4DCD	N. Wilkesboro	52.78	52.525	
		146.42	52.525	
		52.525	146.05	
WA4EHL	Raleigh	52.780	52.525	
		146.42	52.525	
		52.525	146.05	
K4ITL	Raleigh			28–88
WB4PPS	Roaring Gap			22–82
W4EXU	Salisbury			28–88
W4NYR	Shelby			28–88

NORTH DAKOTA

WA0VVZ	Eckman			34–94

OHIO

K8HRS	Ashtabula			34–76
WB8CRS	Cincinnati T1.8			34–94
W8AIC	Columbus			34–76
W8ERD	Columbus	29.50A	146.82F	
		50.54A	146.82F	

2 meter FM Mobility at unheard-of Savings

AVCOM FM-201 SOLID STATE TRANSMITTER MODULE

Starts You on Your Way!

Only $49.95 COMPLETE—Not a Kit 90-Day Warranty

- Ideal for Repeater use! Just add ant., mike, Xtal and 12-16 volts DC.
- Cut Transceiver cost as much as 50%. Add police band receiver to AVCOM FM-201 Transmitter. Your rig can cost under $100 while others are priced up to $250.
- Already have a 2 Meter FM rig? Increase your fun, save installations and removals of your high priced mobile rig with a low-cost second rig.
- Walkie-Talkie compactness — glass epoxy printed circuit board is only 3" x 3½".

SPECIFICATIONS:

Mike Pre-Amp: high impedance input, integrated circuit.

Operates anywhere between 12 and 16 volts DC.

4.0 kHZ frequency deviation typical. 1-Watt DC input to final transistor

Order Your FM-201 Transmitter Module Today!

LM-210 10 Watt POWER Amplifier Module $29.95

AVCOM, Inc.

P.O. BOX 29153 COLUMBUS, OHIO 43229

“HAMTRONICS” IS

A DIVISION OF TREVOSE ELECTRONICS

FM
2 METER
ANTENNAS

- Complete stock of FM Antennas for base or mobile
- Large drive-in on the premises for immediate installation or service
- Complete line of Motorola H.E.P. transistors at all times

by

Cush Craft
CORPORATION

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- HY-GAIN
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- SONAR
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NEW 2 METER FM TRANSCEIVER

Model SRC-146

$279

by
STANDARD
COMMUNICATIONS

Credit cards honored –
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We ship anywhere in USA via UPS – NO CHARGE TO YOU

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- Over $5,000 crystal inventory, all standard frequencies in stock.
- Complete lab set-up, Cushman E-3 counter and deviation scope.
- Every set sold checked out by our FM experts.
- Put precisely on your frequency before shipping to you at no charge.

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MODEL
TR-22

2 meter
FM
Transceiver

$199.95

RECEIVE ANY FREQUENCY IN THE 2M BAND
146–147 MHz) WITH 2 SIMPLE SETTINGS
ON THE NEW CLEGG
FM-27A MOBILE

Clegg DIVISION

Stop in and browse at FM HEADQUARTERS. Free coffee and donuts. FREE – for your use – Frequency Counter in our showroom window runs 24 hours a day. Pull up in front and check your own frequency.

PHONES
(215) 357-1400 **(215) 757-5300**

W8WTB	Columbus			34–76
WB8CQR	Cleveland PL			34–76
WB8CRV	Cleveland CLOSED			
WB8CQK	Dayton T			34–94
W8QLS	Delaware			37–97
		145.62	146.85	
WB8CRL	Fletcher			46–88
WA8WMH	Hamilton			37–97
WA8PLZ	Miamisburg			22–82
	TT	448.60	146.82	
K8PWL	Miamisburg			22–88
WB8CRU	Newcomerstown			34–76
K8JHG	Ottawa			28–88
		52.76	52.525	
		53.38	53.54	
	W1.8	52.76	53.54	
K8ZPR	Steubenville			34–76
WB8CQ0	Toledo			34–76
—	Troy			46–88
W8IOO	Youngstown	Mobile		34–76
		Base		31–76

OKLAHOMA

—	Ardmore			34–94
WA5LDJ	Bartlesville			34–94
		52.525	146.94	
—	Cherokee	146.94F	145.96A	
WA5MQA	Chickasha			34–94
				37–97
		449.45	444.45	
WA5YUH	Durant			34–94
WA5QYE	Enid			34–94
		449.00	447.00	
K5CEM	Oklahoma City			22–82
WA5YTI	Oklahoma City			34–94
WA5ZZA	Oklahoma City			16–76
—	Ponca City			34–94
WA5LVT	Tulsa			34–94
				28–88
		52.68	52.525	
		449.10	444.10	
WA5SJE	Tulsa			22–82

OREGON

W7DBS	Eugene			34–94
—	King Mt.			34–94
—	LaGrande			34–76
W7FIO	Lookout Mt.			34–94
		52.92	53.46	
—	Mary's Peak T2.25			34–94
W7OFY	Medford T2.4			34–94
—	Newport			76–94
—	Pendleton			34–94
K7DVK	Portland	447.17	449.17	
K7SJQ	Portland	444.17	449.17	
W7VS	Portland T2.1			34–94

PENNSYLVANIA

W3OI	Allentown			34–94
WA3IGS	Berwyn			28–76
		52.80	52.72	
W3OK	Bethlehem			16–70
W3VV	Bradford			34–94
				25–85
K3ZTP	Coatsville			22–82
K3DSM	Devon 445.90	448.90		
WA3KUV	Erie			19–79
WA3MOP	Erie	449.55	444.55	
WA3ICC	Harrisburg			34–76
WA3KWI	Philadelphia	449.00	444.00	
W3QV	Philadelphia AM	29.64	29.493	
W3SK	Philadelphia			37–97
K3GKB	Honeybrook			13–73
WA3BKO	Philadelphia			28–88
				16–76
				34–94
				34–76
		446.60	449.60	
WA3KUR	Philadelphia			31–91
		52.72	52.64	
		52.76	52.60	
		448.80	443.80	
WA3QCE	Pittsburgh			34–76
W3BN	Reading	52.575	52.680	
W3CCH	Reading	51.575	52.64	
—	Scranton			34–94
WA3IPP	Sellersville			28–76
				34–76
		446.50	449.50	
WA3KUW	State College			34–76
K3PQZ	York			34–76

RHODE ISLAND

K1OHE	Bristol			34–94
K1ABR	Providence			10–70
W1HQV	Woonsocket			16–76

SOUTH CAROLINA

WB4QGK	Charleston TT1447 Hz			
WA4MPC	Columbia			28–88
WB4PLN	Columbia			34–94
		52.76	52.525	
WB4PUP	Greenville			28–88
				34–94
		52.76	52.525	
WA4SSJ	Greenville	52.76	52.525	

SOUTH DAKOTA

W0BXO	Brookings T2.1			34–94
WA0VVG	Sioux Falls T1.8			34–94

TENNESSEE

WB4KLO	Chattanooga			34–94
K4HXD	Knoxville			34–94
				38–94
		146.34	440.60	
		146.38	440.60	
K4RSV	Lenoir City	146.46	147.06	
W4BS	Memphis			22–76
		440.00	449.00	
W4CV	Memphis			34–94
W4AY	Nashville			10–64
WB4QEY	Nashville	146.04	147.18	
W4RFR	Nashville			34–94
WA4YND	Nashville	146.70	147.70	
—	Oak Ridge			28–88
W4IWV	Shelbyville			34–94

TEXAS

—	Abilene			34–94
—	Alice	444.10	449.10	
W5CBT	Amarillo			34–94
K5FOG	Arlington	53.05	53.15	
		UHF		
W5NEC	Austin			34–94
WA5YTO	Austin	449.10	444.10	
W5AW	Big Spring			34–94
WA5YTJ	Corpus Christi			34–94
WA5HNW	Dallas	53.55	52.95	

WA5VKV	Dallas	449.00	444.00	
WA5VKW	Dallas			28–88
W5HHS	Denton			25–85
WA5MWI	Ft. Smith			34–94
K5DSV	Ft. Worth	53.325	53.725	
WA5KTO	Ft. Worth			16–76
		448.90	443.90	
WA5YTM	Ft. Worth			34–94
—	Ft. Worth	53.05	53.15	
WA5QLA	Houston			28–88
WA5QTZ	Houston			22–82
WA5YUB	Houston			16–76
WA5YTY	Killeen			34–94
WA5YUP	Longview			28–88
WB5BRY	Lubbock			34–94
W5QGG	Midland			34–94
WA5SNJ	Pasadena			34–94
		441.10	449.10	
W5YNL	Plainview			22–82
				22–94
WA5YUS	Port Arthur			34–94
W5UFO	San Angelo			34–94
WA5UNH	San Antonio	52.88	52.525	
WA5VKZ	San Antonio			34–94
		UHF		
WA5LDL	Tyler			34–94

UTAH

WA7GTU	Cedar City			34–94
WA7AKI	Salt Lake City			34–94
		444.90	449.90	

VERMONT

WA1KGM	Mt. Ascutney			16–76
W1ABI	Killington			28–88
		441.20	446.20	
W1KOO	Mt. Mansfield			34–94
		444.40	449.40	

VIRGINIA

WB4QFP	Arlington			31–91
WB4KNX	Charlottesville			28–88
K4OQS	Chesapeake			22–76
WB4QEP	Danville			28–88
WB4KNU	Hampton			34–94
W4GCE	Lynchburg	146.22	147.42	
WB4HCX	Lynchburg			34–94
WB4DRI	Manassas	52.78	52.525	
WB4URR	Manassas W2.5	37–97		
WB4KNN	Newport News			34–94
W4DXC	Richmond	52.72	52.640	
W4NJE	Richmond	146.22	147.42	
		146.22	52.64	
		52.64	147.42	
WB4QEO	Richmond W1.4			34–94
WA4VOS	Richmond			28–88

WASHINGTON

WA7KGV	Bawfaw Mt. T1.95			34–94
WA7KZG	Chehalis T1.95			34–94
—	Ephrata			34–94
W7DAQ	Longview	53.29	146.76	
		146.76	53.29	
—	Moses Lake			34–94
W7QKL	Mt. Rainier			34–76
				34–94
WA7KYY	Mt. Spokane			34–94
K7IUT	Olympic	52.525	53.29	
W7FHZ	Puget Sound CLOSED			
K7PBU	Puget Sound	449.85	444.85	
W7DXX	Rattlesnake Mt.			34–58
W7DBF	Seattle CLOSED			
K7GMR	Seattle	52.525	53.29	
W7PUG	Seattle			88–58
K7LBV	Spokane	52.525	53.29	
K7PYC	Tumwater	52.525	53.29	
WA7AJF	Vancouver	52.92	53.46	
—	Wenatchee			34–94
—	Yakima			34–94

WEST VIRGINIA

WB8ARY	Huntington	34–76
K8SXO	Huntington	34–76
K8BOT	Parkersburg	34–76
K8ZPR	Weirton	34–76
W8JDJ	Wheeling	34–76

WISCONSIN

WA9ZEF	Appleton T1.8	34–76
W9AYR	Green Bay	28–88
WA9PBW	Madisoq T2.1	34–76
WA9WVE	Madison T2,0	46–88
W9ROM	Milwaukee T	34–94
W9AIQ	Sturgeon Bay T1.8	34–76
WA9LIV	Waukegan	34–76

WYOMING

K7KMT	Casper			34–94
		444.55	449.55	
WA7OTP	Casper			34–94
WA7KZC	Laramie			16–76
		444.30	449.30	
WA7EGK	Laramie			34–94
				76–94
K7SDD	Laramie			16–76
W7RPV	Worland			34–94

CANADA

ALBERTA

VE6AUY	Calgary			34–94
VE6WQ	Edmonton	146.46	147.00	
VE6WO	Edmonton	146.46	147.33	
VE6OL	Grand Prairie	146.46	147.00	
—	Lethbridge			34–94
—	Red Deer	146.46	147.00	

BRITISH COLUMBIA

VE7ELK	Chilliwick	146.46	147.00	
		147.33	146.58	
—	Kamloops			34–94
VE7CAP	Kimberly			34–94
VE7BTU	Nelson	146.46	147.33	
—	Penticton			34–94
VE7AFG	Prince George	146.58	147.33	

high performance base loaded 2-meter fm mobile antenna

Model ARD-150 is an easily mounted ⅝ wave mobile antenna with 3 db gain. Produces increased range and better mobile to mobile or mobile to base communications.

Durably constructed to give long lasting performance, all fittings are triple chrome plated brass or stainless steel and the coil is hermetically sealed in A.B.S. to prevent detuning due to moisture or corrosive atmosphere.

Comes complete with built-in heavy duty ½" snap mount (⅜" available at no extra charge) and 20' of coax.

In addition to the regular mechanical inspection, each ARD-150 is 100% tested for V.S.W.R. and "Q" before shipping.

1 year guarantee. If any defect occurs mechanically or electrically, we will replace or repair your ARD-150 at no charge.

SPECIFICATIONS:

$26.95

Frequency—Field tunable 140-175 MHz
V.S.W.R.—1.3:1 or better
Impedance—50-52 ohms
Gain—3 db
Radiator—17-7 PH stainless steel
Spring—stainless steel
Whip Length—Max. 48", Min. 36"

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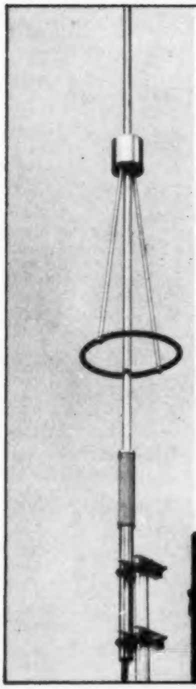
33-35 WEST FULLERTON AVENUE,
ADDISON, ILLINOIS 60101

AVANTI RESEARCH & DEVELOPMENT, INC.

We also have a complete line of high performance base antennas.



NEW CONCEPT... in 2 METER FM OMNI

Again. Out of research comes increased performance. Avanti's unique ARD-257 2-meter FM omni is engineered to give you more gain and all around higher performance than any other antenna of its type or price. The patented tapered skirt configuration produces 4.17 db gain (measured over ¼ wave ground plane) plus a low angle of radiation that has proved effective in eliminating dead spots. No coils or transformers to detune or burn out . . . unaffected by temperature and humidity. The small projected area and light weight provides easy mounting and gives wind survival to 120 MPH.

Construction is all aircraft quality aluminum and fiberglass. Antenna comes complete with coax lead, mounting hardware and fiberglass mast current eliminator.

Other frequencies from 140-175 MHz are available upon specification.

SPECIFICATIONS:

Gain—4.17 db
V.S.W.R.—1.5:1 or less
Bandwidth—±3.5 MHz
Impedance—50-52 ohms
Power Handling—1000 watts
Polarization—Vertical
Connector—PL-259

$44.95

avanti

33-35 WEST FULLERTON AVENUE,
ADDISON, ILLINOIS 60101

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We also have a complete line of high performance mobile antennas.

R and W
R and W

from Ross and White

The 1st 2 meter FM transceiver

with a built-in tone burst encoder*

12 channel capability
4 crystals installed.

Tone burst
encoder built-in
with 3 tones variable
from 1600 to 2400 Hz

All the quality, performance and flexibility that hams want and need for all-around 2 meter FM repeater operation.

- All solid state design—no tubes.
- Individually performance tested before shipment.
- Complete package includes mike and coiled cord.
- Front panel power output selector switch: .1, 1 and 10 watts.
- Can be used with power boosters.
- Mobile mounting bracket.

Model RW-Bnd. SPECIFICATIONS

Transmitter	
RF Power Output:	0.1W ....Low 1.0W ....Medium 10W ....High
Frequency Multiplication:	12 (3 X 2 X 2)
Oscillating Form:	Crystal Controlled
Modulation Form:	Variable Reactance Phase Modulation
Max. Frequency Shift:	±20KHz (1 KHz)
S/N Response:	More than 40 dB at 1 KHz 70% Modulation
Spurious Response:	less than −60 dB
Current Drain:	0.5A for Low, 1.1A for Medium and 2.2A for High RF
Receiver	
Receiving System:	Double Super Heterodyne
Intermediate Frequency:	1st. 10.7 MHz 2nd. 455 KHz
1st Osc. Frequency Stability:	0.002%
Band Width:	28 KHz at 6 dB down (Thru Mechanical Filter)
Selectivity:	60 KHz at 50 dB down (Thru Mechanical Filter)
Sensitivity:	−6 dB (0.5uV)
Squelch:	−8 dB
Audio Output:	0.5W at 8 ohm impedance
Current Drain:	0.22A max. including lamp 0.15A when standing-by with Squelch
Power Requirements	13.5V DC ±10%

** Also available without tone burst encoder.*

WRITE OR CALL TODAY
FOR COMPLETE SPECIFICATIONS
AND PRICE DATA.

DEALER INQUIRIES INVITED

NEED A TONE BURST ENCODER?
ASK FOR DATA ON THE MODEL
TE-2, TE-5 AND TE-P

ROSS and White company
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electronics
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312/537-0060

VE7CAQ	Trail			34–94
VE7RPT	Vancouver			34–94
VE7BUZ	Vancouver			34–94
VE7ACS	Vancouver	147.33	146.58	
VE7BEL	Victoria	146.22	147.54	

MANITOBA

VE4XK	Winnepeg			46–94

NEW BRUNSWICK

VE1PD	Crabbe Mt.	147.80A	144.225A	
VE1VHF	Moncton			46–94
VE1KI	St. John			46–94

NEWFOUNDLAND

VO1GT	St. John's			46–94

NOVA SCOTIA

VE1ARC	Halifax			46–94
VE1JD	Sydney			46–94
VE1XK	Truro			46–94

ONTARIO

VE3KBR	Belleville			46–94
VE3KCR	Chatham			34–94
VE3LCR	Grimsby	146.49	147.09	
VE3DRW	Hamilton			16–76
VE3KER	Kingston	146.34	147.06	
VE3LAC	London	146.46	147.06	
VE3KSR	Kitchener			34–94 37–97
VE3OSH	Oshawa	146.40	147.12	
VE3CRA	Ottawa			46–94
		443.30	448.30	
VE3PBO	Peterborough			34–94
VE3BER	Pt. Colborne FAX, RTTY	449.40	146.70	
VE3STP	Renfrew	146.34	147.06	
VE3NRS	St. Catherines	146.22	147.24	
VE3SAR	Sarnia			34–94
VE3SSM	Sault Ste. Marie			34–94
VE3SRS	Sudbury			46–94
VE3RPT	Toronto	146.46	147.06	
VE3MOT	Toronto	146.58	147.18	
VE3SIX	Toronto	52.760	52.525	
—	Windsor	146.40	147.06	

QUEBEC

VE2CRS	Chicoutimi			46–94
VE2UV	Granby	146.58	147.54	
VE2PY	Laval			28–88
VE2CSL	Matane			46–94
VE2ASU	Mont Buckland	146.70	147.60	
VE2SP	Mont Jim Gray			46–94
VE2TA	Mont Orford	146.52	147.50	
VE2RM	Mont Rigaud	146.40 444.00	147.18 449.00	
VE2XW	Mont St. Bruno	146.70	147.60	
VE2CAT	Montreal			18–64
VE2CLA	Montreal	146. 10	147.30	
VE2OM	Quebec			46–94
VE2VD	Quebec	146.52	147.50	
VE2NY	Riviere-du-Loup			46–94
VE2MT	Shawbridge	146.46	147.06	
VE2SS	Sherbrooke			46–94
VE2CTM	Thetford Mines	146.34	147.40	
VE2AT	Trois Rivieres			46–94

SASKATCHEWAN

VE5SS	Regina	146.46	147.33	
VE5SK	Saskatoon			46–94

FOREIGN

AUSTRIA

OE5XGL	Altmuenster	144.15	145.75
OE7XTI	Innsbruck	144.15	145.75
OE5XUL	St. Johann	144.15	145.75

DENMARK

- -	Copenhagen T1.4&2.2	145.35	145.85
OZ8JS	Hadersley	145.35	145.85

GERMANY

DB0WA	Aachen	144.20	145.80
DB0XA	Altenwalde	144.30	145.70
- -	Audernach-Mayen	144.25	145.85
DB0ZA	Aschberg	144.25	145.85
- -	Bad Koenig	144.175	145.775
DB0XB	Baederstrasse (Baltic Sea)	144.20	145.80
- -	Bamberg	144.20	145.80
DL0JMA	Bayreuth	144.15	145.85
- -	Bentheim-Lingen	144.20	145.80
DL0SB	Berlin	145.15	145.60
DB0WF	Berlin	144.15	145.75
- -	Bocksberg (Harz)	144.175	145.775
DL0BGA	Braunschweig	144.80	145.89
- -	Bremen	144.25	145.85
DB0WC	Bremerhaven	144.20	145.80
- -	Cham	144.15	145.75
- -	Coburg	144.15	145.75
DJ9CRA	Coxhafen	144.15	145.85
- -	Darmstadt	144.20	145.80
- -	Deggendorf	144.20	145.80
DB0WD	Deisier	144.20	145.80
DB0WT	Detmold	144.25	145.85
DB0ZR	Dortmund	144.20	145.80
DB0XR	Dreilaendereck (Loerrach)	144.20	145.80
DB0WN	Duisburg	144.15	145.75
- -	Elm Mountain	144.80	145.90
DB0WE	Essen	144.25	145.85
- -	Feldberg (Rhein-Main)	144.15	145.75
- -	Frankfurt	431.05	438.92
DK0RM	Frankfurt	144.15	145.85
- -	Giessen	431.20	438.80
DB0WG	Goeppingen	144.175	145.775
DB0WS	Goslar-Steinberg	144.25	145.85
DB0ZZ	Grab	144.20	145.80
DB0XG	Greding	144.20	145.80
DB0XH	Hamburg	144.15	145.75
DB0WH	Hannover	144.15	144.75
DB0ZH	Heidelberg	144.25	145.85
- -	Hersefeld	144.20	145.80
DB0YH	Hoechenschwand (Black Forest)	144.25	145.85
DB0WV	Hoechsten	144.25	145.85
- -	Hoher Meissner	144.225	145.825
DB0YK	Homberg-Kaiserslauten	144.20	145.80
DB0ZF	Kaiserstuhl (Freiburg)	144.15	145.75
- -	Kalmit	144.30	145.70
- -	Kassel	144.15	145.75

SBE

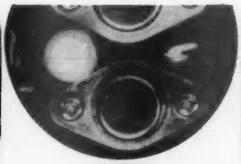
feature after feature after feature

Been denying yourself all that great fun so many other amateurs are having with their rock-solid, through-the-repeater contacts?

Delay no longer! Hasten to your SBE dealer. Verify that the brilliant new **SB-144** has more channels---greater power output ---starts your enjoyment **now** by including three sets of crystals on popular repeater frequencies and a high quality, SBE exclusive dynamic microphone **without extra charge.** Add a sizzling, double-conversion receiver and a combo "S" and output meter with big **lighted** scale that also saves your battery by showing when the transceiver is ON.

Confirm the price then make the deal. Lose no time in securing this book-size beauty under your dash with the tiltable mounting bracket supplied. Then, **power on! ENJOY!**

SB-144 2 meter FM TRANSCEIVER

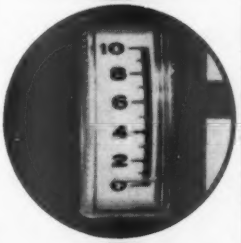


10 WATTS OUTPUT

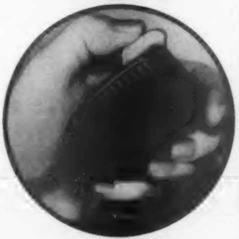
ALL SOLID STATE

12 CHANNELS. BACK LIGHTED NUMBERS

SUPPLIED WITH 3 SETS OF CRYSTALS



LARGE SCALE METER, COMBO, "S"/OUTPUT



SUPPLIED WITH DYNAMIC MIC.

239^{95}

SBE

LINEAR SYSTEMS, INC.
220 Airport Blvd.
Watsonville, CA 95076

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VOICE COMMANDER III

FULLY SOLID STATE FM

Transmitter - Receiver

GENERAL ELECTRIC
COMMUNICATIONS
MIC
OFF
VOLUME
SQUELCH

132 to 174 MHz
1 WATT OUTPUT
1/2 MICRO-VOLT SENSITIVITY
Size: 9.5" x 5.3" x 1.7"

High Performance, completely self-contained two-way FM radio. Compact, lightweight, easily operated and hand-carried. Housed in high-impact 2-section case. All external hardware polished stainless steel.

Includes rechargeable nickel cadmium battery pack and charger. . . . .

$148.00

(Crystals & tuning, add $50)

Lots of 5 less 10% . . . ea. $133.20
Lots of 10 less 15% . . ea. $125.80

Proper chargers available separately. $15. each.

Now . . . . 15,000 2-Way FM Mobile Units In Stock! SEND FOR NEW 1972 CATALOG

GREGORY
GE
ELECTRONICS INC.

GREGORY ELECTRONICS CORP.

The FM Used Equipment People

243 Route 46, Saddle Brook, N. J. 07662
Phone (201) 489 9000
Dept. 73

6&2 m 12 Vhf-fm channels all solid state

IMPROVED.

5 W AUDIO OUT $249.95 PPD. USA.

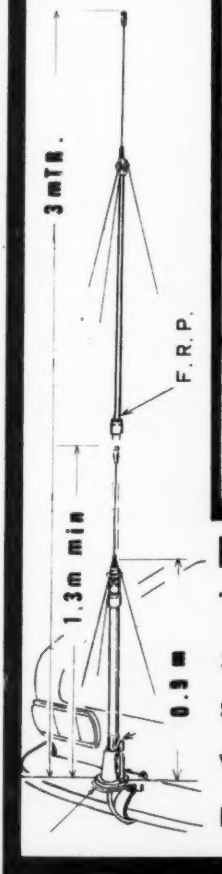
3 CERAMIC I.F. FILTER & MORE

RECEIVER PC BD $ 68.50

XMITTER PC BD $ 79.10

5/8 ROOF SIDE ANT.

REG. DC PWR SPL $ 29.50



NEW SUPER FIBER GLASS TELESCOPIC ANTENNA.

3 Sections or 8 Sections

STAINLESS STEEL ELEMENTS

VSWR. 1.1:1

Mounting brackets Cable incl.

Telecomm Electronics
P.O. Box 461. Cupertino, Ca. 95014

FREQUENCY STANDARD

Gnd Out
100
50
25
10
5
OFF
Zero
FREQUENCY STANDARD
PALOMAR ENGINEERS

Only
$32.50
(less batteries)
POSTPAID USA

- Precision crystal
- Fully guaranteed
- Markers at 100, 50, 25, 10 or 5 kHz selected by front panel switch.
- Zero adjust sets to WWV. Exclusive circuit suppresses unwanted markers.
- Compact rugged design. Attractive, completely self contained.
- Send for free brochure.

PALOMAR
ENGINEERS
BOX 455, ESCONDIDO, CA 92025

DOUBLE YOUR
RANGE!
Four times the POWER equals twice the range –
2m FM Amplifier
4/12 W IN – 20/50 W OUT
Matches
Drake ML SR826M
Tempo VMF IC2F
Regency HR2 ......Swan 1210
Simpson A SB144
Ross & White .... Etc.
Sonar 3601
All automatic TR switching. 7 x 5 x 3.
Model 1050. Order direct...... $99.95
VHF Specialists Box 167
VIENNA, VIRGINIA 22180

TEST EQUIPMENT
INDUSTRIAL & MILITARY SURPLUS
SEND FOR FREE FLY SHEETS ON
ALL CURRENT EQUIPMENT
HARD TO RESIST PRICES
SID GLASS & CO.
BOX 788
BEVERLY HILLS, CALIF. 90213

--	Koblenz	144.20	145.80
--	Koeln-Bergheim	144.25	145.85
DB0WK	Koustanz	144.15	145.75
--	Knuell	144.25	145.85
DB0WL	Lahr	144.15	145.75
--	Leer/Ostfriesland	144.20	145.80
DJ3JWA	Lindau-Hertz	144.15	145.85
--	Lindau-Northeim (Hannover)	144.20	145.80
DL0BLB	Ludwigsburg	144.85	145.30
DB0YY	Ludwigsburg	144.30	145.70
DB0ZL	Luechow/Elbe	144.20	145.80
DB0XS	Merzig/Saar	144.25	145.85
DB0ZM	Munich	144.15	145.75
DB0WM	Muenster/Westf.	144.25	145.85
DB0ZN	Neuersberg	144.15	145.75
DL0NFA	Nurnberg	144.15	145.85
DB0ZB·	Ochsenkopf	144.25	145.85
DB0WN	Ochsenwarig	144.225	145.825
DB0ZO	Osnabruck	144.15	145.75
DL0ZR	Schwerte	145.15	145.90
DB0WS	Siegen	144.20	145.80
DB0WR	Stuttgart	144.15	145.75
DB0WX	Triberg	144.20	145.80
DB0ZW	Weiden	144.20	145.80
DB0WB	Winterberg	144.15	145.75
DB0WZ	Wurzburg	144.25	145.85
DB0ZU	Zugspitze	144.275	145.725

NEW ZEALAND

New Zealand has been working on a 2 meter band plan for the country, with provision for all modes of operation.There are FM simplex channels every 50 kHz from 145.8 to 146.2 MHz, with 145.85, 146.0 and 146.15 MHz, as the prime channels. 146.0 MHz to be first. On the FM repeater side they have allocated four channels on 700 kHz spacing. A pity, as it does not make them compatible to Australia. Inputs on 146.3, .35, .4 and .45 with the outputs on 145.6, .65, .7 and .75. The three-channel AM repeater systems have inputs on 144.6, .65 and .7 with the outputs on 145.725, .775 and .825. 144.8 MHz is set aside as an RTTY net frequency. The beacons are on the "hundred" equal to the call area, e.g. ZL1 on 145.1, ZL2 on 145.2, ZL3 on 145.3, and ZL4 on 145.4 MHz. The segment 144.0 to 144.1 MHz is set aside as DX and experimental working. 144.1 to 144.5 MHz is a general working segment.

SWEDEN

SK0DZ	Stockholm T2.172	144.90	145.80
--	Rommeleasen T2.172	144.90	145.80

SWITZERLAND

--	Appenzell T1.595	431.20	438.80
--	Fribourg T1.29	431.05	438.92
--	Luzern T1.16	431.20	438.80
--	Luzern T1.595	431.05	438.92
--	Solothurn T1.16	431.20	438.80
--	Zurich T1.16	431.05	438.92

HIGH GAIN ● LOW NOISE

35 dB power gain, 2.5–3.0 dB N.F. at 150 MHz, 2 stage, R.F. protected, dual-gate MOSFETS. Manual gain control and provision for AGC. 4-3/8" X 1-7/8" X 1-3/8" aluminum case with BNC receptacles and power switch. Available factory tuned to the frequency of your choice from 5 MHz to 350 MHz with approximately 3% bandwidth. Up to 10% B.W. available on special order.

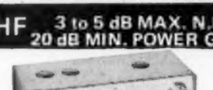
Model 201 price:
5–200 MHz . . . . $21.95.
201–350 MHz. . . . . $24.95.

UHF 3 to 5 dB MAX. N.F. 20 dB MIN. POWER GAIN

The Model 202 uses 2 of T.I.'s super low noise J-FETS in our special circuit board design which gives a minimum of 20 dB power gain at 450 MHz. Stability is such that you can have mismatched loads without it oscillating and you can retune (using the capped openings in the case) over a 15–20 MHz range simply by peaking for maximum signal. Available tuned to the frequency of your choice between 300–475 MHz. 4-3/8" X 1-7/8" X 1-3/8" aluminum case with BNC receptacles and power switch.

Model 202 price: . . . . . . $31.95.

VHF FM RECEIVER 11 CHANNELS ● 135–250 MHz



● 11 crystal-controlled channels. ● Available in your choice of frequencies from 135–250 MHz in any one segment from 1–4 MHz wide. ● I. F. bandwidth (channel selectivity) available in your choice of +/– 7.5 kHz or +/– 15 kHz. ● 8-pole quartz filter and a 4-pole ceramic filter gives more than 80 dB rejection at 2X channel bandwidth. ● Frequency trimmers for each crystal. ● .2 to .3 μvolt for 20 dB quieting. ● Dual-gate MOSFETS and integrated circuits. ● Self-contained speaker and external speaker jack. ● Mobile mount and tilt stand ● Anodized alum. Case, 6" X 7" X 1 3/8".

Model FMR-250-11 price:
135–180 MHZ. $109.95
181–250 MHz $119.95

Price includes one .001% crystal. Additional crystals $6.95 ea.

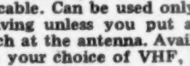
40 dB GAIN 2.5–3.0 N.F. @ 150 MHz

2 RF stages with transient protected dual-gate MOSFETS give this converter the high gain and low noise you need for receiving very weak signals. The mixer stage is also a dual-gate MOSFET as it greatly reduces spurious mixing products — some by as much as 100 dB over that obtained with bipolar mixers. A bipolar oscillator using 3rd or 5th overtone plug-in crystals is followed by a harmonic bandpass filter, and where necessary an additional amplifier is used to assure the correct amount of drive to the mixer. Available in your choice of input frequencies from 5–350 MHz and with any output you choose within this range. The usable bandwidth is approx. 3% of the input frequency with a maximum of 4 MHz. Wider bandwidths are available on special order. Although any frequency combination is possible (including converting up) best results are obtained if you choose an output frequency not more than 1/3 nor less than 1/20 of the input frequency. Enclosed in a 4-3/8" X 3" X 1-1/4" aluminum case with BNC receptacles, power and antenna transfer switch.

Model 407 price:
5–200 MHz . . . . $42.95.
201–350 MHz. $44.95

Prices include .005% crystal. Additional crystals $5.95 ea.

WEATHERPROOFED AND D.C.POWERED THROUGH ANTENNA CABLE



Models 101 and 102 only are available enclosed in a die-cast weatherproof case for mounting at the antenna in series with the lead-in cable and includes a filter for sending 12 VDC through the cable. Can be used only for receiving unless you put a TR switch at the antenna. Available with your choice of VHF, BNC or type "N" receptacles. Especially useful for eliminating antenna line loss and thereby improving signal-to-noise ratio of weak signals such as those from weather satellites at 137 MHz.

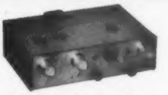
Price: Add $10.00 to pre-amps.

LESS THAN 2 dB N.F. GAIN: 20 dB @ 150 MHz. SIZE: 2½" X 5/8 X 1"

Features a super low noise J-FET rated by T.I. as typically 1.2 dB N.F. @ 150 MHz (transistor data curves supplied with unit) and guaranteed by our lab to give under 2 dB actual N.F. in our circuit. Transistor is mounted in a socket with gold plated contacts. 4 precision trimmers make possible tuning for optimum desired results over a wide range of conditions. We supply it tuned for minimum noise figure across 50 ohms input and output resistance. Fully shielded in aluminum case with feed-thru solder terminals. Supplied with mounting kit for installing inside or outside your receiver. Tuned to the frequency of your choice from 135 MHz to 250 MHz with approximately 2–4 MHz bandwidth.

Model 102 price: . . . . . .$19.95.

UHF 20 dB MIN. GAIN 3 to 5 dB MAX. N.F.



This model is similar in appearance to our Model 407 but uses 2 low noise J-FETS in our specially designed RF stage which is tuned with high-Q miniature trimmers. The mixer is a special dual-gate MOSFET made by RCA to meet our requirements. The oscillator uses 5th overtone crystals to reduce spurious responses and make possible fewer multipliers in the oscillator chain which uses 1200 MHz bipolars for maximum efficiency. Available with your choice of input frequencies from 300–475 MHz and output frequencies from 14–220 MHz. Usable bandwidth is about 1% of the input frequency but can be easily retuned to cover more. This model is now in use in many sophisticated applications such as a component of a communications link for rocket launchings.

Model 408 price: $51.95
.005% crystal included.

HOW TO ORDER:

State model, input and output frequencies and bandwidth where applicable. Remit in full, including sales tax if you reside in N.Y. State, direct to Vanguard Labs. Prices include postage by regular parcel post. For air mail or special delivery include extra amount; excess will be refunded.

Vanguard Labs

196–23 JAMAICA AVE., HOLLIS, N.Y. 11423

2 METER FM HEADQUARTERS

Rigs for every use . . .
for every pocketbook!

NEW! HANDY-TALKY

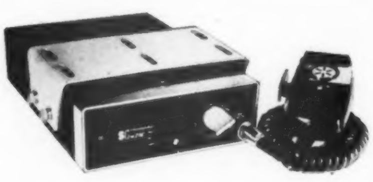
STANDARD SRC-146

5 Channels — .94/.94 and .34/.94 supplied
.3 uV receiver — 1.5 W transmitter
Compact — 8"h x 3" w x 1½ d
Full line of optional accessories includes external speaker-mike — desktop charger — "stubby" antenna — and more!

Available NOW! — Only $279.00

ALL PURPOSE

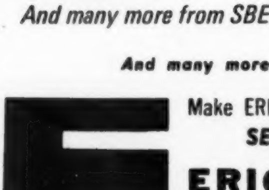
STANDARD 826M



12 channels (4 with crystals)
10 Watt output
All solid state
Hot MOSFET receiver

Only $339.95

TEMPO SOLID-STATE POWER AMPS



MODEL	DRIVE POWER	OUTPUT POWER	PRICE
1002-3	5-25 watts	100-135 watts	$220
1002-3B	1-2.5 watts	120-130 watts	$235
802	5-12 watts	70-90 watts	$165
802B	1-2.5 watts	80-90 watts	$180
502	5-15 watts	35-55 watts	$ 99
502B	1-2.5 watts	45-50 watts	$125
242-A2	1-2.5 watts	25-30 watts	$ 85

And many more from SBE/Clegg/Gladding/Kenwood/Tempo/Antenna Specialists/Larsen
All U.S. Made

And many more from Dycomm/Kenwood/Tempo/Antenna Specialists

Make ERICKSON your headquarters for all your FM needs . . .
SEND QSL FOR COMPLETE SPECIFICATIONS

ERICKSON COMMUNICATIONS
4653 N. Ravenswood Ave., Chicago, Ill. 60640 (312) 334-3200

The 2-Meter FM Rig The Experts Praise

GLADDING 25™

PEARCE - SIMPSON
LOW
TX POWER
VOLUME
CHANNEL
SQUELCH
OFF
GLADDING 25
PEARCE - SIMPSON

6 CHANNELS/2 METER/TRANSCEIVER/25 WATTS

Power is the keyword when discussing Gladding 25™, the two meter transceiver the experts recommend.

Gladding 25 is so similar to our marine gear (we're the leader in AM and FM marine communications) we are able to take advantage of the tremendous buying power and production efficiencies our huge volume gives us. The result is remarkably low priced. A Gladding 25™ has the power, price and the features amateurs want most, with unmatched quality.

• 25 Watts output • 0.3 micro volt uv sensitivity for 12 db SINAD • Dynamic microphone for unmatched audio • Six separately switchable transmit and receive channels • Crystal supplied for 149.94 simplex and repeater capability on 146.34/146.76 and 147.34/146.94 mHz • 12 volt mobile unit has matching accessary AC power supply • Vacuum tube driver and final for reliability and economy • 8 pole crystal lattice filter • Solid state receiver • Transistor sockets • Glass epoxy printed circuit boards • Quick disconnect power plugs • Mobile mounting brackets • One watt output capability for short range communications.

$249.95
for mobile unit

$299.95
with accessory AC power supply

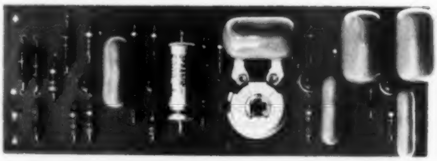
Write for complete information.

PEARCE-SIMPSON
DIVISION OF GLADDING CORPORATION
P.O. Box 800, Biscayne Annex, Miami, Florida 33152

SUB-AUDIBLE TONE ENCODER and DECODER KITS

- Compatible with all sub-audible tone systems such as Private Line, Channel Guard, Quiet Channel, etc.
- Glass epoxy PCB's and silicon transistors used throughout
- Any type reeds may be used: Motorola, G.E., RCA, S.D.L., Bramco, etc. except special dual coil types
- All are powered by 12 vdc
- Use on any tone frequency 67 Hz to 250 Hz

ENCODER



$8.95 - Kit

$13.95 - Wired-Tested

- Small size 1.5 x 4 x 75"
- All parts included except reed and reed socket
- Output 4v RMS sinewave, low distortion

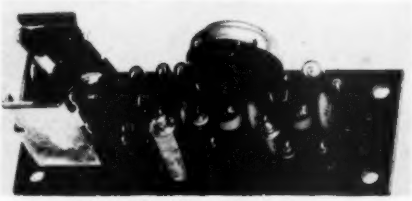
WIRE-IN TYPE DECODER

$9.95 - Kit

$14.95 - Wired-Tested

- Same small size as encoder 1.5 x 4 x .75"
- All parts included except reed and reed socket
- Output relay included, low profile sealed type.
- Driven directly off discriminator of any FM receiver

MINIATURE ENCODER



$14.95 - Wired-Tested

- Miniature in size 2.5x .75x1.5" high
- Any miniature dual coil contactless reed may be used (Motorola TLN6824A, TLN6709B – Bramco RF-20)
- Complete less reed (Available in 33 frequencies for $17.50 ea.)
- Output 3v RMS sinewave, low distortion

All material shipped postpaid (Calif. residents add 5% sales tax)
Send check or money order to:

Communications Specialists

P.O. BOX 153 • BREA, CALIFORNIA • 92621

Mann
COMMUNICATIONS

APRIL SPECIALS

MOTOROLA μ44BBT–3000
450 MHz MOBILE RADIO UNIT
10" HOUSING
TRANSISTOR POWER SUPPLY
LESS ACCESSORIES. $59.00

ACCESSORIES AVAILABLE WITH MOBILE PURCHASE

WRITE FOR FREE CATALOG

Mann Guarantee

Money refunded without question if equipment is returned within seven days from shipment, undamaged, freight prepaid.

Conditions of Sale

Unless otherwise specified, equipment is used, and is sold as-is. All items shipped FOB Tarzana, California. Crystals, ovens, antennas not included unless specifically stated in catalog. All equipment is sold on a first-come, first-served basis.

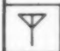
Mann COMMUNICATIONS

18669 Ventura Blvd.
Box 138 Tarzana, CA 91356
(213) 342-8297

2837 North 24th Street
Phoenix, Ariz 85008
(602) 955-4570

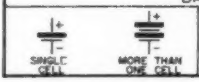
ELECTRONIC SYMBOLS

ANTENNA



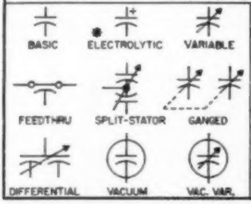
NORMALLY USED IN BLOCK DIAGRAMS, BUT MAY BE USED IN ANY SCHEMATIC WHERE ANTENNA IS CONNECTED DIRECTLY TO CIRCUIT WITHOUT BENEFIT OF RF CONNECTOR

BATTERY


SINGLE CELL
MORE THAN ONE CELL
+
-

DO NOT FORGET TO INDICATE VOLTAGE AND POLARITY

CAPACITORS


BASIC
✱ ELECTROLYTIC
VARIABLE
FEEDTHRU
SPLIT-STATOR
GANGED
DIFFERENTIAL
VACUUM
VAC. VAR.

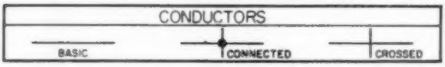
NOTE THAT CURVED PORTION OF SYMBOL ALWAYS DESIGNATES OUTSIDE FOIL OF FIXED CAPACITORS (EXCEPT ELECTROLYTICS, WHERE IT INDICATES THE NEGATIVE TERMINAL)

THE CURVED PORTION IN THE CASE OF A VARIABLE WILL INDICATE THE MOVABLE PART

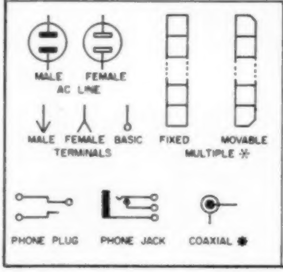
✱ INDICATE POLARITY, AND VALUE IN μF

WHEN OTHER THAN ELECTROLYTIC, VALUES ARE ASSUMED TO BE pF WHEN 1 OR GREATER, AND μF WHEN LESS THAN 1

CONDUCTORS


BASIC
CONNECTED
CROSSED

CONNECTORS

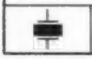

MALE
FEMALE
AC LINE
MALE
FEMALE
BASIC
TERMINALS
FIXED
MOVABLE
MULTIPLE ✳
PHONE PLUG
PHONE JACK
COAXIAL ✱

SHOULD NONE OF THE SYMBOLS DESCRIBED HERE SEEM TO MATCH YOUR SITUATION, DESCRIBE THE CONNECTOR AND/OR LIST THE MANUFACTURER'S PART NUMBER

✱ FOR ANY COAXIAL-TYPE CONNECTOR, SUCH AS RF, MICROPHONE, PHONO, ETC.

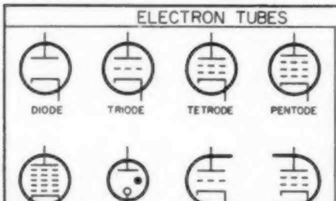
✳ NUMBER THE BLOCKS TO CORRESPOND TO TERMINAL MARKINGS, WHEN APPROPRIATE

CRYSTAL



ALWAYS INDICATE CRYSTAL FREQUENCY (IN kHz, MHz, ETC.)

ELECTRON TUBES

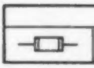

DIODE
TRIODE
TETRODE
PENTODE
PENTAGRID
VOLTAGE REGULATOR
EXAMPLE OF MULTIPLE-SECTION TUBE
CATHODE RAY
PLATE
GRID
CATHODE
✱ HEATER (FILAMENT)
DEFLECTION PLATE
GAS FILLED
COLD CATHODE

ALWAYS LABEL ELEMENTS WITH TUBE PIN NUMBERS

REFER TO TUBE MANUAL FOR DATA ON INDIVIDUAL TUBE TYPES

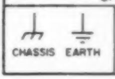
✱ FILAMENTS OR HEATERS (WITH THE EXCEPTION OF DIRECTLY-HEATED CATHODES) SHOULD BE SHOWN EXTERNAL TO TUBE CIRCLE, AND PREFERABLY IN THE POWER SUPPLY

FUSE



INDICATE CURRENT, VOLTAGE RATINGS, AND SLO-BLO, ETC., AS APPROPRIATE

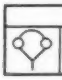
GROUND CONNECTIONS


CHASSIS
EARTH

CHASSIS GROUND SYMBOL IS NORMALLY THE ONLY TYPE USED IN SCHEMATICS

EACH GROUNDED CIRCUIT COMPONENT WILL BE SHOWN CONNECTED TO AN *INDIVIDUAL* CHASSIS GROUND, UNLESS A COMMON GROUND BUS IS ESSENTIAL TO PROPER CIRCUIT OPERATION

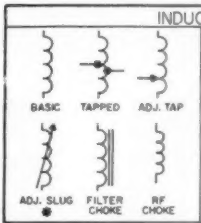
HEADSET



NORMALLY USED IN BLOCK DIAGRAMS, BUT MAY BE USED IN ANY SCHEMATIC WHERE CONNECTED DIRECTLY INTO CIRCUIT WITHOUT PHONE PLUG

INDICATE IMPEDANCE IF VALUE IS CRITICAL

INDUCTORS

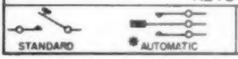

BASIC
TAPPED
ADJ. TAP
ADJ. SLUG ✱
FILTER CHOKE
RF CHOKE

INCLUDE ALL NECESSARY DATA INCLUDING ANY OF FOLLOWING INFORMATION WHICH IS APPLICABLE:

- WIRE SIZE & TYPE
- COIL OR FORM O.D. OR I.D.
- NUMBER OF TURNS AND/OR LENGTH
- MANUFACTURERS PART NUMBER
- TAP POSITION ABOVE COLD END

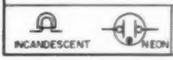
✱ FERRITE CORE WILL BE ASSUMED UNLESS BRASS IS SPECIFIED. INDICATE TYPE OF FERRITE, IF CRITICAL

KEYS


STANDARD
✱ AUTOMATIC

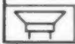
✱ BE SURE TO DESIGNATE "DIT" & "DAH" CONTACTS

LAMPS


INCANDESCENT
NEON

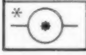
INDICATE MANUFACTURER'S PART NUMBER AND/OR VOLTAGE & CURRENT RATING

LOUDSPEAKER



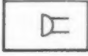
INDICATE VOICE COIL IMPEDANCE & POWER RATING, ETC., WHEN CRITICAL

METERS



✱ INDICATE TYPE OF METER HERE (μA, mA, V, ETC.)
✳ INDICATE SCALE RANGE HERE (0-1, 0-50, ETC.)
DON'T FORGET TO INDICATE PROPER POLARITY

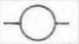
MICROPHONE



NORMALLY USED IN BLOCK DIAGRAMS BUT MAY BE USED IN SCHEMATIC WHEN WIRED DIRECTLY INTO CIRCUIT WITHOUT CONNECTOR

INDICATE TYPE (CARBON, XTAL, ETC.)

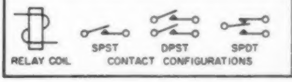
MOTOR



LABEL AS MOTOR, FAN MOTOR, ETC.

INDICATE OPERATING VOLTAGE & CURRENT AND/OR MANUFACTURER'S PART NUMBER

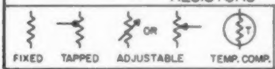
RELAYS


RELAY COIL
SPST
DPST
SPDT
CONTACT CONFIGURATIONS

SPECIFY COIL VOLTAGE, RESISTANCE, ETC., AND/OR MANUFACTURER'S PART NUMBER

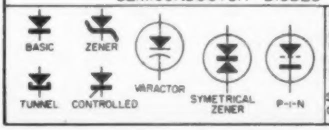
CONTACT CONFIGURATIONS SHOWN ARE BASIC AND MAY BE EXPANDED

RESISTORS


FIXED
TAPPED
ADJUSTABLE
OR
TEMP. COMP.
T

INDICATE VALUE, IN OHMS(Ω), KILOHMS(k), OR MEGOHMS(M), AND/OR MANUFACTURER'S PART NUMBER.
1/2W 10% IS ASSUMED UNLESS OTHERWISE NOTED

SEMICONDUCTOR DIODES


BASIC
ZENER
TUNNEL
CONTROLLED
VARACTOR
SYMETRICAL ZENER
P-I-N

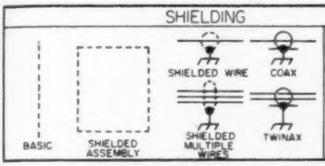
INDICATE MANUFACTURER'S PART NUMBER AND/OR APPROPRIATE RATINGS

REFER TO MANUALS FOR SYMBOLS NOT SHOWN

S INDICATES SILICON
G " GERMANIUM

ELECTRONIC SYMBOLS

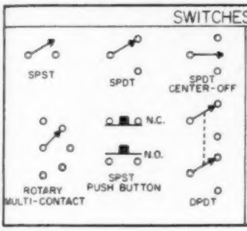
SHIELDING


BASIC
SHIELDED ASSEMBLY
SHIELDED WIRE
COAX
SHIELDED MULTIPLE WIRES
TWINAX

SHIELDS ARE ASSUMED TO BE GROUNDED UNLESS OTHERWISE NOTED

INDICATE IF SHIELD ON CONDUCTOR IS TO BE GROUNDED ONE END ONLY, & SPECIFY WHICH END

SWITCHES


SPST
SPDT
SPDT CENTER-OFF
N.C.
N.O.
ROTARY MULTI-CONTACT
SPST PUSH BUTTON
DPDT

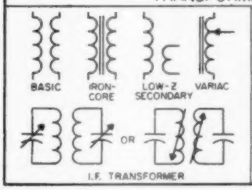
ONLY BASIC CONFIGURATIONS ARE SHOWN. COMBINE OR EXPAND AS NECESSARY TO SUIT

SELF-HOLDING SWITCH OPERATION IS ASSUMED UNLESS SPRING-RETURN IS SPECIFIED

NON-SHORTING TYPE IS ASSUMED UNLESS SHORTING TYPE IS SPECIFIED

SWITCH SECTIONS WHICH ARE SIMULTANEOUSLY OPERATED OR GANGED SHOULD BE JOINED WITH A DOTTED LINE

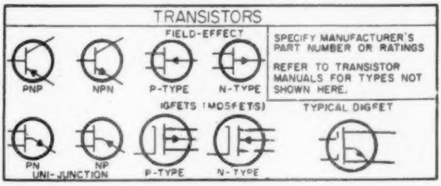
TRANSFORMERS


BASIC
IRON-CORE
LOW-Z SECONDARY
VARIAC
OR
I.F. TRANSFORMER

SHOW (4) LOOPS EACH WINDING EXCEPT (6) LOOPS ON HIGH-VOLTAGE SECONDARIES AND (2) ON FILAMENT WINDINGS AND NON-RESONANT LOW-Z RF COUPLING LINKS

TRANSFORMER DESCRIPTION SHOULD INCLUDE MANUFACTURER'S PART NUMBER AND RATINGS, OR CONSTRUCTION DATA

TRANSISTORS


FIELD-EFFECT
PNP
NPN
P-TYPE
N-TYPE
IGFETS (MOSFETS)
TYPICAL DIGFET
PN
NP
UNI-JUNCTION
P-TYPE
N-TYPE

SPECIFY MANUFACTURER'S PART NUMBER OR RATINGS

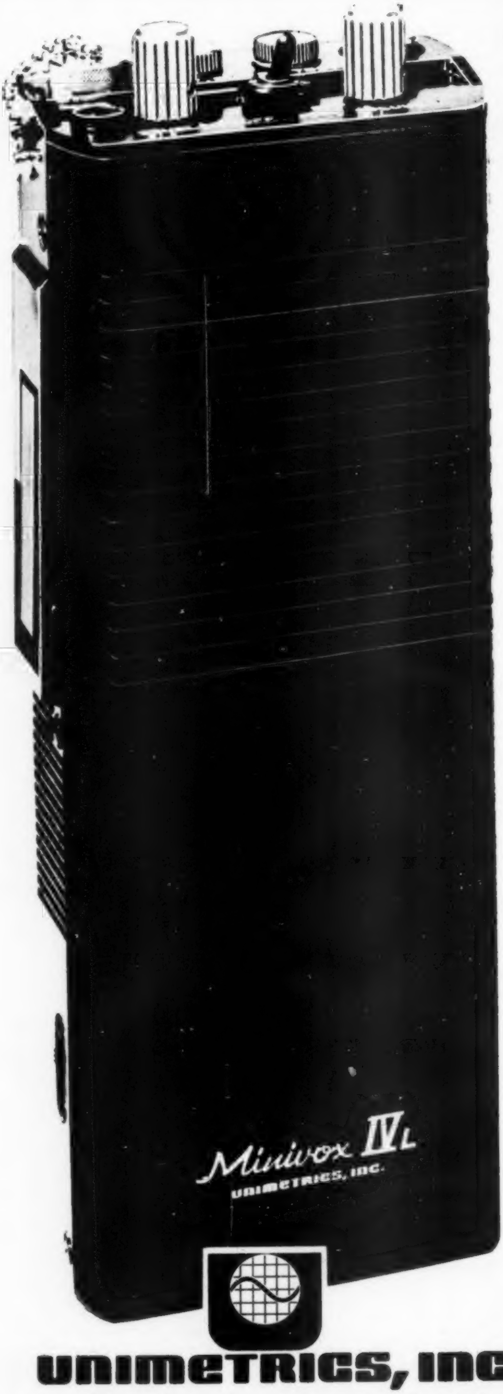
REFER TO TRANSISTOR MANUALS FOR TYPES NOT SHOWN HERE.

ELECTRONIC ABBREVIATIONS

(AS USED ON DRAWINGS AND SCHEMATICS)

NOMENCLATURE	ABBREVIATION(S)
ALTERNATING CURRENT	AC
AMPERE	A
AMPLIFIER	AMP
AMPLITUDE MODULATION	AM
ANTENNA	ANT
AUDIO FREQUENCY	AF
AUTOMATIC FREQUENCY CONTROL	AFC
AUTOMATIC GAIN CONTROL	AGC
AUTOMATIC VOLUME CONTROL	AVC
BATTERY	B
BEAT FREQUENCY OSCILLATOR	BFO
BROADCAST	BC
CAPACITANCE, CAPACITOR	C
CONTINUOUS WAVE	CW
CRYSTAL	X, XTAL
CURRENT	I
DECIBEL	dB
DIODE, SEMICONDUCTOR (ALL TYPES)	D
DIRECT CURRENT	DC
DOUBLE COTTON COVERED	D.C.C.
DOUBLE POLE DOUBLE THROW	DPDT
DOUBLE POLE SINGLE THROW	DPST
DOUBLE SILK COVERED	D.S.C.
ELECTRON TUBE (ALL TYPES)	V
ENAMEL COVERED	ENAM
FILAMENT	FIL
FREQUENCY	FREQ., f
FREQUENCY MODULATION	FM
FUSE	F
GROUND	GND
HENRY	H
HERTZ (CYCLES PER SECOND)	Hz
IMPEDANCE	Z
INDUCTANCE, INDUCTOR	L
INSIDE DIAMETER	I.D.
INTERMEDIATE FREQUENCY	I.F
JACK	J
KILOHERTZ (KILOCYCLES PER SECOND)	kHz
KILOHM	k, kΩ
KILOVOLT	kV
KILOWATT	kW
LAMP	I
LOUDSPEAKER	SPKR
MEGAHERTZ (MEGACYCLES PER SECOND)	MHz
MEGOHM	M, MΩ
METER	M
MICROAMPERE	µA
MICROFARAD	µF
MICROHENRY	µH

NOMENCLATURE	ABBREVIATION(S)
MICROPHONE	MIC
MICROVOLT	µV
MICROWATT	µW
MILLIAMPERE	mA
MILLIHENRY	mH
MILLIVOLT	mV
MILLIWATT	mW
NEGATIVE (POLARITY)	−, NEG
NORMALLY CLOSED	NC
NORMALLY OPEN	NO
OHM	Ω
OSCILLATOR	OSC
OUTSIDE DIAMETER	O.D.
PICOFARAD	pF
PLUG	P
POSITIVE (POLARITY)	+, POS
POWER AMPLIFIER	PA
PRIMARY	PRI
PUSHBUTTON	PB
RADIO FREQUENCY	RF
RADIO FREQUENCY CHOKE	RFC
RECEIVE	REC
RECEIVER	RCVR
RELAY	K
RESISTANCE, RESISTOR (ALL TYPES)	R
ROOT MEAN SQUARE	RMS
SECONDARY	SEC
SHORTWAVE	SW
SINGLE COTTON COVERED	S.C.C.
SINGLE POLE DOUBLE THROW	SPDT
SINGLE POLE SINGLE THROW	SPST
SINGLE SILK COVERED	S.S.C.
SWITCH	S
TIME	t
TRANSFORMER	XFMR, T
TRANSISTOR (ALL TYPES)	Q
TRANSMIT	XMIT
TRANSMITTER	XMTR
ULTRA HIGH FREQUENCY	UHF
VACUUM TUBE VOLTMETER	VTVM
VERY HIGH FREQUENCY	VHF
VOLT OHM METER	VOM
VOLT, VOLTS	V
VOLTAGE	E
WATT	W
WAVELENGTH	λ



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xtra sets of crystals	$15.00
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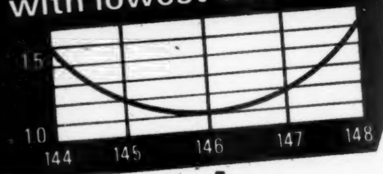
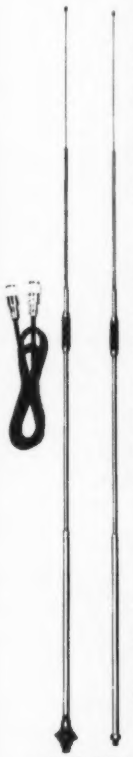


to push your signal MILES more...

6 & 2 METER MOBILE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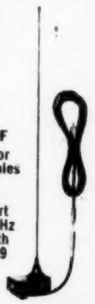
Trunk Lip Mount



140-500 MHz UHF/VHF

Easy to install on side or rear of trunk lip. No holes to drill or coax to trim. 17-7 PH stainless steel radiating element. Chart included for 140-500 MHz coverage. Complete with 17' RG-58-U and PL-259

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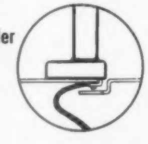

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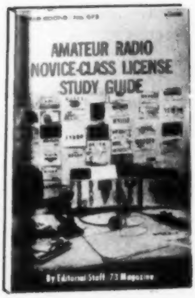
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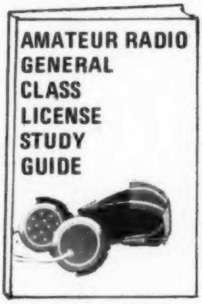
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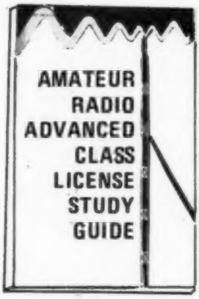
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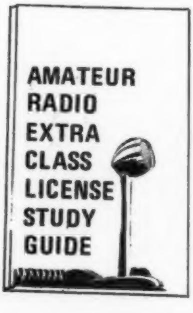
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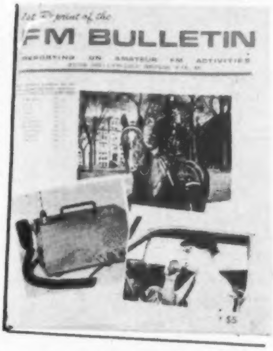
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EQUIPMENT REVIEW

COMCRAFT
CTR-144

TESTING THE COMCRAFT CTR-144

Can an FM nut live comfortably with a tunable receiver and a vfc transmitter?

As an old time two meter addict my hands began to shake with anticipation as I plugged in the new Comcraft transceiver, just looking forward to being able to tune the receiver dial and get back to the old familiar concept of frequency being marks on a slide rule dial instead of numbers on a switch.

Sure enough, as I tuned from 146.5 to 147.0 there were all the repeaters, blasting through. And even though this segment of the two meter band takes up only about 3/8" of the dial, I still could identify most of the repeater channels by their position on the dial. The receiver was quite sensitive and I was able to hear repeaters right on down to New Haven, some 150 miles or so away.

The most exciting discovery was that "secret" repeater up in Manchester (NH) up above 147 MHz. I knew their input frequency, but had not been able to get them to spill the beans on the output so I could get crystals and their promises of getting crystals for me had been dragging on for a couple of years, so when I tuned across the repeater output I let out a whoop and zeroed in the Comcraft vfo and called in. There was a stunned moment of silence and then they acknowledged me. I didn't tell them how I found them.

The vfo is stable enough to work through FM repeaters with no problem. My counter shows it to hit within 25 Hz or so each time it is keyed! There are three internal crystal positions plus a front panel jack for a fourth crystal position. The rig uses the very popular 8 MHz FT-243 type crystals, which are still around by the thousands from WW II.

The CTR-144 is basically an up-to-date solid state Communicator. It tunes from 144–148, with enough overlap to bring joy to the MARS and CAP enthusiasts. My unit tuned from 144.00 to 148.15 on both receiver and vfo, but this could be easily changed enough to add or subtract a half MHz or so by touching the band-setting capacitors.

The power supply is built in for 117V ac operation, plus the usual 12V dc power cord for mobile use. A little battery test button on the front panel lets you check the battery condition. This test button may not be of great interest for mobile applications, but if the unit is used in conjunction with the accessory CBP-12 Comcraft battery pack, it will tell you how things are going. This battery pack is automatically recharged by the ac supply, by the way.

The receiver gets its selectivity and rejection of images by a clever system of i-f management. The first local oscillator is at 65 MHz and is crystal controlled. This doubles to 130 and the output is in the 14–18 MHz range which is tuned by the first i-f. The second local oscillator drops the i-f to 2 MHz and then the signal is channeled into either an FM or AM detector.

The 65 MHz oscillator is used by the transmitter to beat the 7–9 MHz vfo up to 72–74 MHz. This is then doubled to the output frequency.

While I find a counter quite helpful in putting the CTR exactly on a repeater input frequency, I have had little trouble zeroing in just by listening for the repeater squelchtail and tickling the vfo dial until I hit the pass-band. While visiting New York I cut a 19" length of coathanger and stuck it into the antenna conductor, zipped onto WA2SUR's input on 146.19 and found myself talking with a number of old friends. This was from my livingroom in Brooklyn about five miles away!

While I appreciate the benefits of channelized operation as much as anyone, I do have to admit that I like it a lot that I can now tune the 144 MHz band complete and check to see what is going on. And who can afford all the crystals it takes to get all of the repeaters? With new repeaters coming on the air by the week, who can keep up with it? I'd be ordering more crystals every week and, at $4 to $6 each, this is a luxury beyond the means of a mere magazine editor.

One thing I did learn from being able to tune the entire 144 MHz band . . . the FM activity is just about the only activity that I'm going to hear up this way. I may be able to get into seventeen FM repeaters from my home, but I have heard one and only one AM signal on the band in several weeks of listening. I haven't had a good chance to tune the entire band since my NC-300 receivers were swiped a few years ago. The band sure has changed!

The Comcraft CTR-144 may not meet the demands of the purist FM old timer, but it sure does do its job well and is a lot of fun. And it will run AM if you need it!

. . .W2NSD/1

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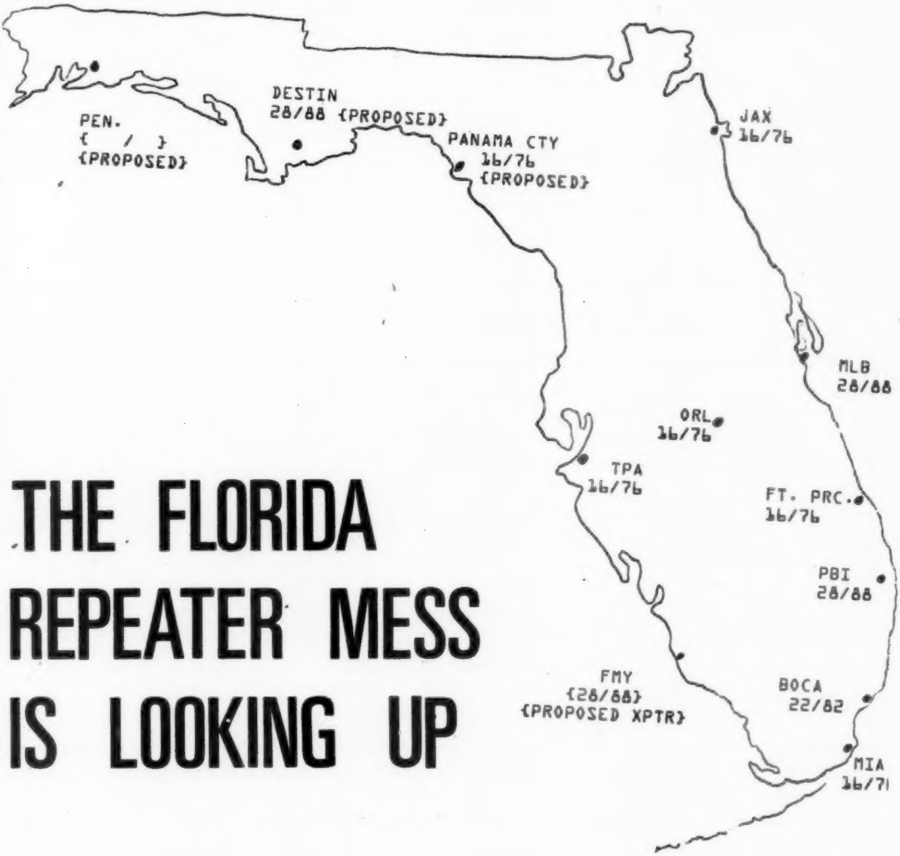
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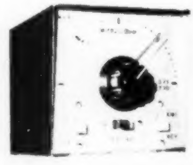
THE FLORIDA REPEATER MESS IS LOOKING UP

Jeffrey R. Harrow WA4RLG
1336 S. Biscayne Pt. Rd.
Miami Beach FL 33141

I'm not all that old (22) and yet, as I look back about six years it seems an immensely long time ago that Glynn WA4LHK, Bill WA4MKD, myself, and the rest of the renowned N.O.M.A.R.C. group put on (to my knowledge) the first amateur two meter repeater in Florida. It consisted of a pre-prog. G.E. into two ground planes up about five stories – and we were ecstatic with a one to two mile range.

Well, as you can see from the sketch, Florida took to two meters with a vengeance. So much so, in fact, that for the past couple of years, a problem pretty old to the California and New England areas has become evident. With so many repeaters in operation, and with about 90% of them on 34/76, we had the old problem of high powered base stations in Tampa keying the Miami repeater, and vice versa. After a while, the Melborne repeater came on, and later was joined by the Boca Raton machine, 43 miles north of Miami. It got to the point where most people were shutting off their receivers because they were having to listen to too many one-sided conversations not meant for them.



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Then, about eight months ago, the Orlando repeater came on in the center of the state. Poor Melborne. Poor Tampa. Orlando base stations were consistently keying up their repeaters with 20 dB to full quieting signals. Melborne even changed their receiver antenna orientation to reduce the problem (and in doing so, though, they removed repeater coverage from a rather barren stretch between Orlando and Melborne, a nice place to have a flat tire). At the same time down in Miami, the Boca repeater was going strong. It put usable signals into Miami, and communications took on quite an interesting assortment of squeals, grunts, and shouts of "Hey, control station, please shut this &S#¢% machine down so I can talk to Boca."

Up to now I've described a situation very familiar (or it may soon be) to most of you. Here is the solution that the South Eastern Repeater Association committee, headed by Hal Greenley K4GYO, proposed, and which was adopted by all of the S.E.U.S. repeaters:

On January 15, 1972, all of the S.E. repeaters changed their main input frequency to either 146.16, 146.22, or 146.28 MHz. The specific frequency allocations were made by the committee, based on factors including location, seniority, adjacent repeaters, etc. These inputs are "open," that is, no tone coding of any kind. Each repeater also maintains a 146.34 MHz input. This 34 input is Touchtone coded with a different code assigned to each repeater. The code performs a latching function (at the discretion of each repeater) or a time delay. For instance, if the Miami repeater 34 input hears a digit one, it will open, and leave open, the 34 input of the machine, until it hears another digit one, when it will close the 34 input. The 16, 22, or 28 inputs will have priority over the 34 input. So if a station comes on 16, the 16 station will take over, or capture the repeater, even if a station is already transmitting on 34.

Several months later, each repeater will change its output frequency to 146.76, 146.82 and 146.88 MHz respectively.

Now, what have we gained from this mildly expensive and time consuming area-wide change?

First of all, by careful frequency assignments, mobiles using one repeater will not – under normal conditions – be able to key up the closest repeater using the same channel. Notice that I said mobiles. What about base stations?

All base stations will be requested to use the 146.34 inputs. This serves several purposes. First and foremost, it allows a mobile, any mobile, and even an HT, to break into a chat by a base station to request help, report accidents, etc. (Remember our justification for existence – public necessity, interest, and convenience.) Secondly, it allows high powered base stations in Miami for instance, to talk through the Orlando repeater without keying up, or tying up other repeaters around the state. Toward this end, all the individual repeater need do is to keep its 34 input tone coded off when not in use. The repeaters with 34 coded off will not be bothered by the long haul conversation. Of course, two cross-state conversations at once could pose a problem, but then nothing (yet) is perfect. I might also point out that traveling mobiles who can't cram in two more sets of crystals can utilize the 34 input of any repeater he is near with his Touchtone pad. The only disadvantage for mobile use of 34 is that several repeaters will only operate one centralized 34 receiver while they may have several satellite receivers on their main discrete frequency. Third, if more areas conform to these standardized channels (and they are), only three sets of crystals will be necessary to cover most of the country. Rick WB4IES, and I recently took a light plane trip from Miami to San Francisco and back; we know we missed more repeaters than we worked. Also, the many combinations of PL tones described in several magazines won't be necessary.

This is the beginning of the standardization which is so necessary to our continued expansion. This plan, which you notice incorporates 600 kHz spacing between the repeater transmit and receive frequencies allows more practical one-site repeaters. Another not so obvious advantage is that standard 600 kHz spaced, 60 kHz staggered channels make frequency synthesis somewhat easier to produce.

Certainly there are some objections and disadvantages to this plan. The most often heard seems to be the expense of the new crystals and the fact that "We were here first, why should we move?" Well, the expense, especially in the field of ham radio, is rather minimal. It is interesting to note, however, that most forms of improvement and progress cost some money. This isn't the first and certainly not the last such instance. To the other objection, that of "squatters' rights," I say this: Each motorist on the road has given up some of his freedom – such as having to stop at a traffic light when he is in a hurry. To go further, the nations of the world have given up some of their freedoms – such as not indiscriminately testing nuclear weapons. This giving up of "rights" is done in order to bring about the greater good of all. The same thing holds true here. I read a very disturbing article recently where a group of irate two meter hams had a repeater evicted from a beautiful mountain top site because it was bleeding into their receivers 30 kHz and ten miles away. At this, I can only shake my head.

All in all, two meters is growing; well in some areas, and poorly in others. If we all give just a little we may one day see a beautifully interlinked repeater system not only in Florida but extending toward the rest of the country with autopatch facilities and possibly FAX or TV. Atlanta and Florida are even now beginning to talk of a link!. And remember, amateur satellites can do more than broaden our horizons – they can literally jump them!

Repeaters are becoming more prevalent, and with a consistent, carefully planned *system*, each repeater will be covering a larger and larger area without bothering its neighbor. And remember, if the FCC receives many complaints from irate repeater groups they could justifiably impose their own rules. We have traditionally been a self-policing group, and it would behoove us to retain this system.

The future? It's governed by what we do today! Remember how the fantastically complex Bell system started.

. . .WA4RLG

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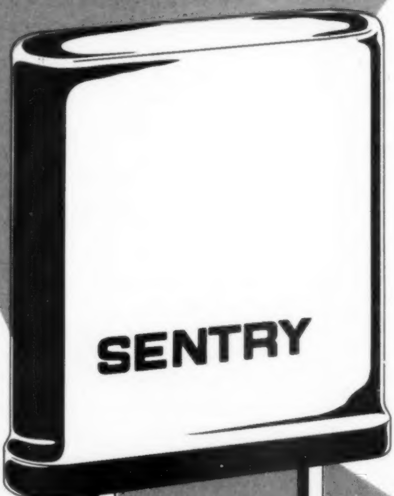

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EQUIPMENT REVIEW

Ed Webb W4FQM/1
Technical Editor
73 Magazine

Ross and White RW-Band Tranceiver

The Ross and White RW-Bnd 2 meter FM transceiver is one of the newer entries to the FM market place, and it brings with it several unique features.

You can put it in your glove compartment, it is so small. The front panel mike socket lets its trim design slide into narrow places, like the empty hole in your dashboard where the AM radio used to be. If you prefer to keep it outside, you can mount it underneath the dash or on the transmission hump with the mounting bracket that is included. And this rig is portable too. You can use it with a shoulder strap and flashlight batteries. Its size is deceptive because it is loaded with features. Keep reading.

The little knob at the side is for the built-in tone burst encoder. More and more repeaters are requiring tones to activate the transmitters and other functions of the repeaters, such as low band links. In some areas that have several repeaters with the same input frequency, a different tone is required to turn on each particular machine. Other rigs require externally connected boxes that have the tone generators inside. The generator is already inside the RW-Bnd. These tones are easily reached for field adjustment and the three switchable positions should be sufficient even for the frequent traveler. Since the tone circuits use ICs, they are trouble free and should require no maintenance at all.

You will notice that there are four knobs on the front panel. There is a volume and a squelch control as with all others. To turn it on, you turn on the volume and adjust it for a comfortable noise level with the squelch open. Right? Wrong. Once you have adjusted these two controls you should not need to adjust them again because the main power switch is included in the power level switch. There are three power levels (plus 'off') that offer a variety of operating conditions. The low power slot is fine for talking to the mobile who is following you. No need to tie up a lot of other people on the direct channel. The medium power level is perfect for keeping in touch with the base when you head out for a loaf of bread. Incidentally, these two levels are satisfactory for portable operation using batteries or other situations where low current power suplplies only are available, such as when you are on a business trip. The usefulness of this rig for emergencies is self-evident; low current drain, built in tone burst, and small size. If there is no emergency and you are just talking to the distant repeater several cities away, the high power position is the ideal level as this allows the rig to run ten-plus watts output to the antenna.

Do you have visions of plugging your rig in and pushing the mike button and watching the relative rf output meter quickly flash to maximum and then crashing to zero? This will not happen with the RW-Bnd because it has a protection circuit that prevents the final transistor from blowing out if the swr is too high, such as when you forget to connect the antenna or a low tree branch takes it off.

The circuitry is modern and of advanced design. For example, the transmitter uses an IC oscillator. Most other rigs do not have an IC here. In the receiver, the sharp i-f does not block or get cross-talk from adjacent channels. Once inside the rig, you will notice that there is a lot of room. You will be grateful for this when you try to change crystals for the transmitter or receiver becuase there is room to get a couple of fingers in there and you do not have to use a pair of pliers that might pinch the crystal. Each rock has a trimmer capacitor to let you get it exactly on frequency, transmit and receive. Twelve channels are sufficient for most areas and this is what you have in the RW-Bnd. In case one of your local repeaters has not switched to the standard 600 kHz spacing, crystal jumpering is easy.

Once the rig is installed, the clear, clean and plentiful audio will strike you. The front mounted speaker is what does it. The audio is not directed at your feet nor is it muffled in the maze of wires behind the dashboard. You will not need to hook up an external speaker to hear this one. Another useful feature is the accessory jack on the rear panel. It is connected to nothing. Your own needs and imagination are the determining factors here. Do you use a Touchtone pad? Tie it in here. Do you use a continuous tone squelch system (PL)? Attach it to this plug. Perhaps you want to run the audio output to another speaker in the rear of the car. It is easily done. You can even bring out test points for monitoring the functions of the rig.

One other valuable contribution the Ross and White people have given the ham for maximum enjoyment of his FM rig is a complete instruction manual. Book is a better word to use. It has pictorials, parts placement pictures, voltage tests, operating theory, and more. It is a valuable volume for the proud RW-Bnd owner.

For more information about this great rig, contact Ross and White at *50 West Dundee Road, Wheeling IL 60090*. . . .Staff

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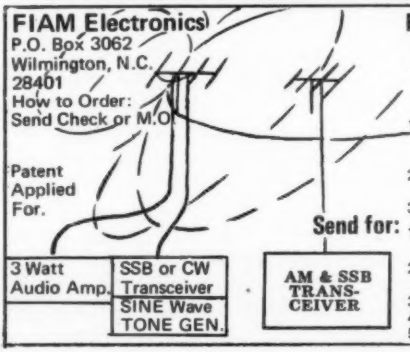

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FROM JIM, WN5COZ

NOAA Studies Ionospheric Effects of Thunderstorms

Reprinted from Collector and Emitter, a publication of the Aeronautical Center Amateur Radio Club of Oklahoma City, Oklahoma.

Scientists of the Commerce Department's National Oceanic and Atmospheric Administration have found that thunderstorms transmit tremendous sound pulses into the ionosphere 125 miles above the earth.

By observing these high-altitude perturbations with carefully sited radio transmitter/receiver arrays, the scientists have determined that a pulse can give the ionosphere a three-mile lift directly above the originating storm.

Dr. Kenneth Davies of NOAA's Apace Environment Laboratory at Boulder, Colorado, says the ionosphere begins responding to thunderstorms about the time their tops have reached the 40,000-ft level.

The turbulence within the thunderstorm produces pulsations which travel through the atmosphere as pressure waves. Unlike radio waves, which penetrate the atmosphere without affecting the natural gases through which they pass, these pressure waves move by a

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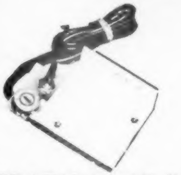

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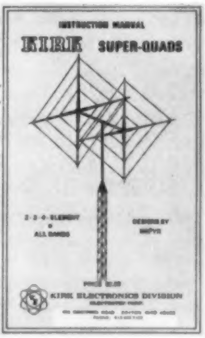

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train of collisions between molecules along the path. As a molecule of atmospheric gas is perturbed by the pressure wave, it moves, striking a neighboring molecule which in turn moves and strikes another.

These infrasonic pulsations originate in the lower atmosphere (troposphere), where the molecules of gas are packed densly, so that each molecule travels a short distance before striking another (less than one millionth of an inch). As the pulsation travels upward to the ionosphere, the atmosphere thins and the molecules are farther apart. At an altitude of 125 miles; the molecules of gas are so thinly distributed that one may have to travel 1,000 ft before colliding with another. This density reduction is responsible for a 1,000 times amplification of the vertical movement of the atmosphere at ionospheric altitudes. The actual upward surge of the atmosphere (not the individual molecules, but the whole mass of air in the region affected by the acoustic pulse) is about 15 ft at cloud level and 15,000 ft in the ionosphere.

Because of the geometry of the earth's magnetic field, the electronis in the ionosphere behave differently from the neutral gases, which are unaffected by geomagnetism. South of the detection array, the atmospheric surge carries across the magnetic field lines. The neutral constituent moves upward normally, but the charged electrons are restrained by the field. Because radio signals are reflected from the electrons and not the neutral part of the ionosphere, the movement cannot be observed.

To the north, however, the atmospheric pulses move along the magnetic field lines, and the electrons easily move with it. Thus, the surge of the ionosphere can be observed by reflections from the mass movement of electrons north of the transmitter/receiver array.

Observations indicate, according to Davies, that when ionospheric responses to thunderstorms occur, the top of a cumulonimbus cloud has risen to more than 40,000 ft within 150 miles of the midpoint of the radio circuit. Such responses have been recorded on the Oklahoma paths and on paths between Long Branch, Illinois, and Boulder, Colorado.

Reporting in the Journal of Atmospheric Science (March 1971) on studies of the ionospheric responses, Davies and John E. Jones, also of NOAA's Space Environment Laboratory, cited two principal advantages of using the ionosphere to detect the pulsations generated in the troposphere: (1) the density decrease with altitude in the atmosphere provides natural amplification of the generated pulses, and (2) the atmosphere acts as a filter to remove unwanted acoustic waves. In effect, the ionosphere is a natural tuned receiver. The amplification is several hundreds to one, although interference from acoustic waves of unknown origin does occur.

On the basis of present knowledge, it is difficult to relate the ionospheric measurements directly to characteristics of the thunderstorm. As with any new technique, a considerable body of data must be gathered and time spent in analysis before the relationships are understood. A 10 to 20-year lag between a scientific discovery and its routine use is not unreasonable, according to Davies.

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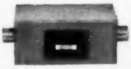

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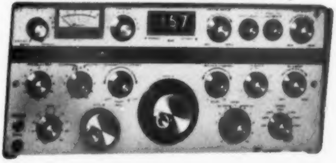

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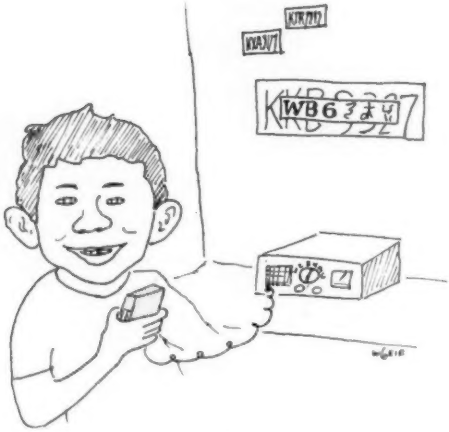
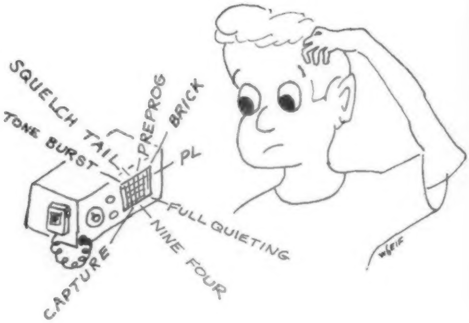
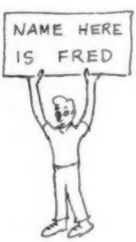
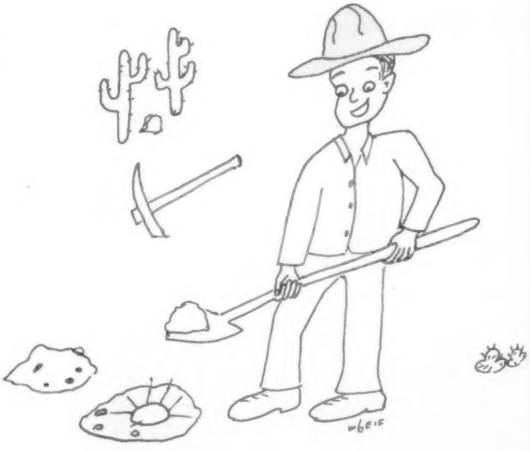


The "D-C" band operator

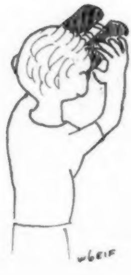

SQUELCH TAIL
TONE BURST
PREPROG
BRICK
PL
FULL QUIETING
NINE FOUR
CAPTURE

The FM newcomer


NAME HERE IS FRED



The EIA



The 20-meter DX'er

H.T. (Tom) Orr W6EIF/4
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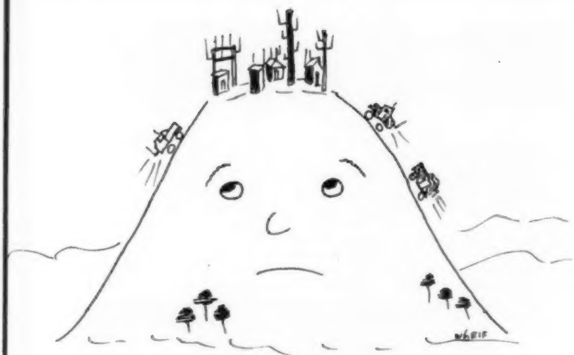
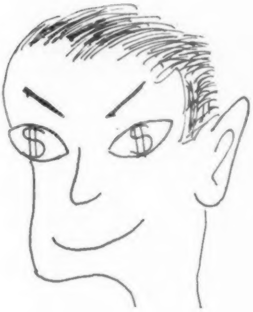
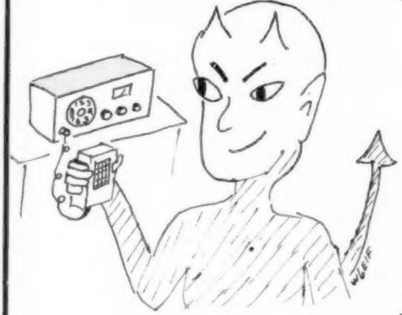
Bay Point
Key West FL 33040



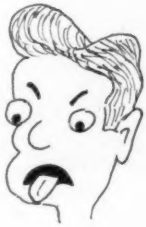
The mountain tops



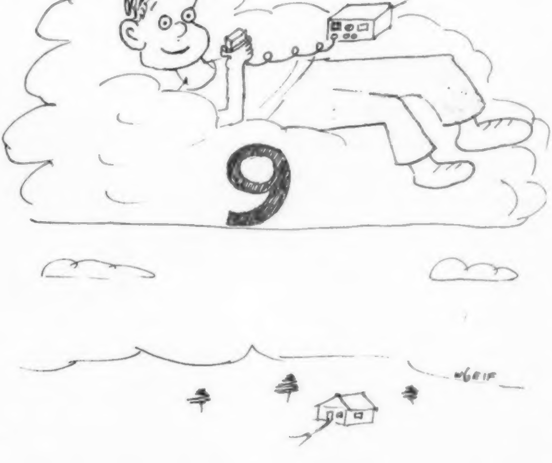
The Japanese manufacturer



The repeater jammer



Any other mode as seen by the FM'er



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Solid state encoder TE-5 five tone	$49.95

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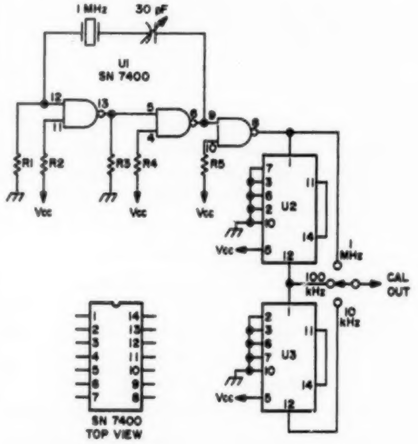
CIRCUITS, CIRCUITS, CIRCUITS. . .

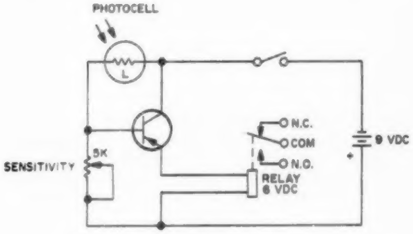
The following circuits have appeared in the referenced books, magazines, application notes, etc. While we try to reproduce all of the information that should be needed by an experienced constructor, readers may want to avail themselves of the original sources for peace of mind.

Readers are requested to pass along any interesting circuits that they discover in sources other than U.S. ham magazines. Circuits should be oriented toward amateur radio and experimentation rather than industrial or computer technology. Submit circuit with all parts values on it, a very brief explanation of the circuit and any additional parts information required, give the source and a note of permission to reprint from the copyright holder, if any, and the reward for a published circuit will be a choice of a 73 book. Send your circuits to 73 Circuits Page, 73 Magazine, Peterborough NH 03458.

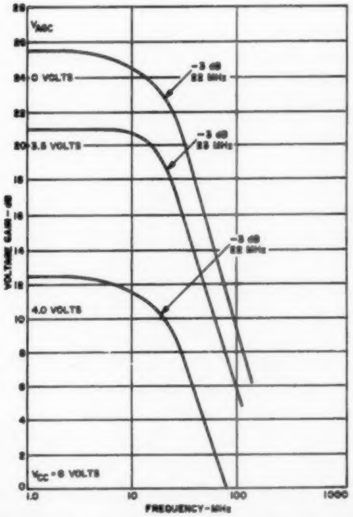

1 MHz
30 pF
U1
SN 7400
R1
R2
R3
R4
R5
Vcc
U2
U3
1 MHz
100 kHz
10 kHz
CAL OUT
SN 7400
TOP VIEW

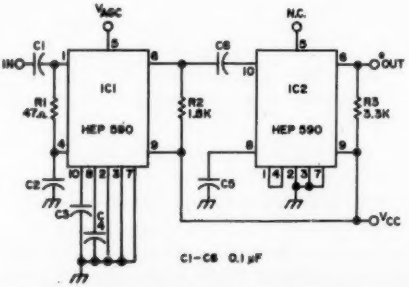
R1, R3	1.8K	
R2, R4, R5	1K	
U1	SN 7400	QUAD 2-INPUT NAND GATE
U2, U3	SN 7490	DECADE COUNTERS
Vcc	5 VDC	

This crystal calibrator has a fundamental 1 MHz crystal and its frequency is divided to give outputs of 1 MHz, 100 kHz and 10 kHz. All the parts used are easily available from Polypaks, HAL Devices, etc., for a small fee. Circuit courtesy of Zero Beat (Victoria BC) for November, 1971

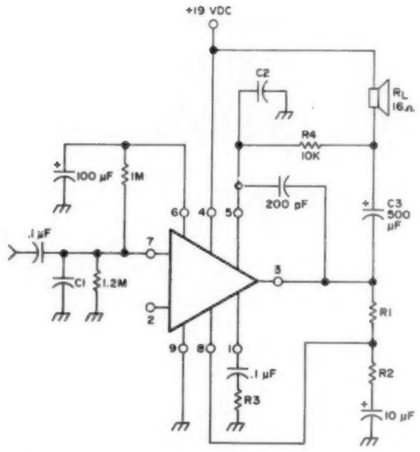

PHOTOCELL
L
N.C.
COM
N.O.
9 VDC
SENSITIVITY
5K
RELAY
6 VDC

Turn anything on – or off – with light. Use it to trigger an alarm, to turn on lights at dusk, activate a counter as people pass. . .or whatever. Easy-to-build versatile circuit courtesy of Calactro Handbook. Transistor is a Calectro K4-505.

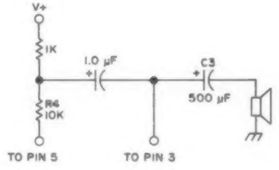



V_AGC
N.C.
IN
OUT
C1
C2
C3
C4
C5
C6
R1 47Ω
R2 1.8K
R3 3.3K
IC1 HEP 590
IC2 HEP 590
Vcc
C1–C6 0.1 µF

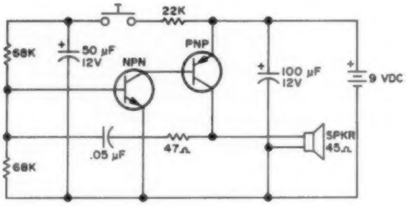
Two stage video amplifier with AGC control of IC gain and no tuned circuits required. The curve shows the video amplifier response with AGC. This circuit from Motorola HEP Radio Amateur's IC Projects HMA-36, available free from Motorola, Dept. 73, Box 20924, Phoenix AZ 85034.


+19 VDC
C2
RL 16Ω
R4 10K
100 µF
1M
200 pF
C3 500 µF
.1 µF
C1
1.2M
6
4
5
7
3
2
9
8
1
R1
R2
.1 µF
R3
10 µF

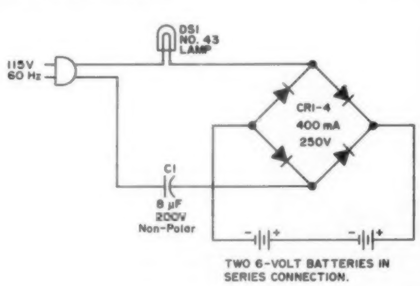
SENSITIVITY FOR Po mV	C1 pF	C2 pF	R1 k OHMS	R2 OHMS	R3 OHMS	RL OHMS	Po W
600	0	0	10	1.0K	82	16	2.0
15	100	100	51	100	2.2K	16	2.0


V+
1K
1.0 µF
C3
500 µF
R4 10K
TO PIN 5
TO PIN 3

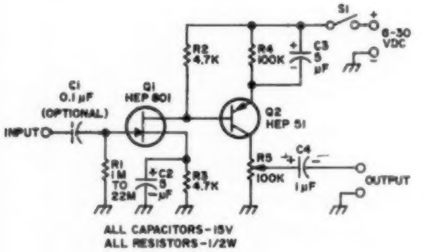
A typical circuit application utilizing a Motorola MFC9010 monolithic functional circuit, which is a 2-watt audio amplifier designed to provide the complete audio system in TV, radio and phonograph equipment. Schematic at right shows alternate connection to permit connecting speaker to ground instead of to V+. Circuit courtesy Motorola Functional Circuits handbook.


68K
50 µF 12V
NPN
PNP
22K
100 µF 12V
9 VDC
.05 µF
47Ω
SPKR 45Ω
68K

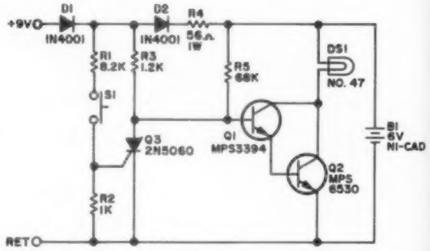
Another Calectro circuit, this one a screaming siren. Tone rises and falls like the big ones. Circuit courtesy Calectro Handbook (50¢), 400 S. Wyman, Rockford IL 61101. Q1 is a Calectro K4-506, Q2 a K4-505, S1 is a push button switch.


DS1 NO. 43 LAMP
115V 60 Hz
CR1-4 400 mA 250V
C1
8 µF 200V Non-Polar
TWO 6-VOLT BATTERIES IN SERIES CONNECTION.

Simple ni-cad battery charger circuit from FM Magazine, as reprinted in The Best of FM, an anthology of articles from FM Magazine published by 73 and available from 73 Magazine, Peterborough NH for $4.95.


S1
6-30 VDC
R2 4.7K
R4 100K
C3 5 µF
C1 0.1 µF (OPTIONAL)
Q1 HEP 801
Q2 HEP 51
INPUT
R1 1M TO 22M
C2 5 µF
R3 4.7K
R5 100K
C4 1 µF
OUTPUT
ALL CAPACITORS-15V
ALL RESISTORS-1/2W

Audio amplifier. This circuit has a high impedance input, low current drain (0.2 mA), low impedance output, wide range (10-30,000 Hz) and a gain of 200 to 400. Circuit courtesy Motorola HMA-33 Tips on Using FETs.


+9V
D1 1N4001
D2 1N4001
R4 56Ω 1W
DS1 NO. 47
R1 8.2K
R3 1.2K
R5 68K
S1
Q3 2N5060
Q1 MPS3394
B1 6V NI-CAD
Q2 MPS 6530
R2 1K
RET

Power failure indicator. Indicates either momentary or continuous power failure. Circuit courtesy Motorola Semiconductor Power Circuits Handbook. When circuit is reset it will trickle charge the battery, keeping it at full charge.

EXTRA CLASS LICENSE STUDY GUIDE

Questions & Answers Part I

The Extra class amateur license is the highest rank of license offered, and as such demands the greatest knowledge of radio and electronics theory and practice (in fact, the Extra class exam requires at least as much knowledge as does the First Class Commercial Radiotelephone license with radar endorsement, generally accepted as being the most demanding of all FCC exams).

Because of the greater requirements of the Extra class license, its official study list of questions is the longest and most detailed of all the FCC study lists, totalling 90 questions. For comparison, the General class study list contains only 52 questions and the Advanced class has 65. What's more, the Extra class questions frequently call for detailed discussions of the subject rather than simple one-sentence replies.

Because of the greater detail and larger number of questions to be covered, we've divided the Extra Class Q&A portion of this license study course into two sections of 45 questions each. This section contains the first 45 questions, with our answers. The next one will contain the remaining questions, 46 through 90.

We must emphasize that this is merely a checklist which you may use as a "final exam" to test your readiness for the Extra class exam. Explanation of the material has been held to the mimimum; for details, refer to the Extra class study series previously published in 73 Magazine, or our reprint of the series.

1. What are sideband frequencies? During 100% sinusoidal amplitude modulation, what percentage of the average power is in the sidebands? How is the sideband power related to the percentage of modulation?

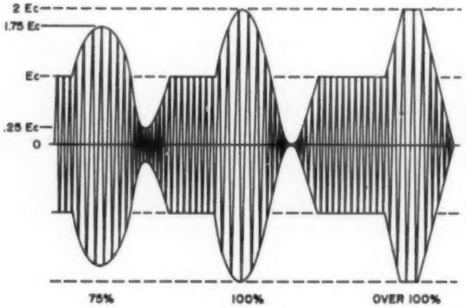
A. Sideband frequencies are those frequencies contained in the "sidebands" of a modulated signal. The sidebands consist of frequencies above and below the carrier frequency, which correspond to the sum of carrier and modulating frequency, and the difference, respectively. If the carrier is modulated by a single frequency, the side frequencies will also be single frequencies. If the carrier is modulated by a band of frequencies (as is usually the case, for voice transmission) the sum and difference signals become bands also, accompanying the carrier.

During 100% sine-wave AM, one-third of the average envelope power (total signal power) is in the sidebands and two-thirds is contained in the carrier. That is, the sidebands contain half as much power as the carrier.

Modulation percentage is based on a voltage measurement. Power varies as the square of the voltage, so the power content of the sidebands will vary between 0 and 1/3, proportionally to the percentage of modulation as it varies from 0 to 100.

2. What do the modulation envelopes of amplitude-modulated waves with 75%, 100%, and greater than 100% modulation look like?

A. Refer to Fig. 1 for views of the modulation envelopes.



3. How may a limiter be employed in an FM receiver?

A. In an FM receiver, the purpose of the limiter is to remove all amplitude variations from the received signal, thus reducing atmospheric noise (which consists primarily of AM components).

4. What precaution(s) should be taken when measuring the rectified grid voltage in an oscillator with a dc voltmeter?

A. For the protection of the voltmeter, all rf energy should be blocked from reaching the voltmeter by use of an rf choke in series with the voltmeter "hot" lead. To assure that oscillator operation suffers minimum disturbance, a high-impedance voltmeter should be used, and care should be taken to avoid introducing stray capacitance.

5. What is meant by frequency shift keying and how is it accomplished?

A. Frequency shift keying (FSK) is a form of modulation usually used in RTTY operation in which the "mark" condition is represented by a signal at one frequency and the "space" condition is represented by a signal at another frequency. One of the two signals is always present, but they are never present simultaneously.

FSK is usually accomplished by switching a small capacitance into and out of the oscillator resonator circuit, to produce the lower of the two frequencies when the capacitor is in the circuit, and the higher when it is out of the circuit. This switching is frequently accomplished by diodes.

6. Why is there a practical limit to the number of stages that can be cascaded to amplify a signal?

A. The amount of amplification which can be applied to any signal is limited by the unavoidable electrical noise introduced both by the early amplifying stages, and present with the signal when it enters the amplifier.

The final limit is reached when the noise that accompanies the signal at the input to the amplifier is the controlling factor. "Low noise" amplifiers are designed with the intent of reaching this limiting condition, and it can be reached in practice at all frequencies in normal use, from the audio range through SHF.

Certain techniques of "coherent detection" make use of a prior knowledge of the nature of the expected signal to dig into the accompanying external noise for the signal. Such techniques, for instance, make possible radar measurement of the distance from Earth to Venus, and are used in many types of communications. Even these techniques, though, are ultimately limited by the random and unpredictable nature of background noise.

7. What are A5 and F5 emissions? On what amateur frequencies can these emissions be transmitted? Can A5 emission be transmitted satisfactorily using one sideband only?

A. A5 and F5 both designate video signals; A5 means amplitude-modulated video, while F5 stands for frequency-modulated video.

Since video signals cover a bandwidth from dc up to several MHz, A5 signals are seldom satisfactory if transmitted using one sideband only, due to phase shift of the low-frequency components. To overcome this situation, yet reduce the extreme bandwidth which would otherwise be required, commercial television uses the "vestigial sideband" method to transmit by A5 signals. A vestigial-sideband signal is a normal DSB (with carrier) signal at very low frequencies, but one sideband (normally the lower one) is cut off at 750 kHz, so that at modulating or sideband frequencies greater than 1.25 MHz the signal is single sideband. Between 750 and 1250 kHz, the lower sideband is rapidly attenuated. Thus a video bandwidth of 4.5 MHz is compressed into a channel only 6 MHz wide, including guard bands and audio information.

Both A5 and F5 emissions are legal on all amateur bands above 420 MHz.

8. How does amateur TVI usually affect television reception?

A. Alarmingly. The interference may manifest itself in any of a number of ways. Either the audio or the video parts of the TV signal, or both, may be affected.

If audio is affected, the TV viewer usually hears a distorted version of the amateur's transmissions. This is usually due to audio rectification, the same action which affects hi-fi and stereo sets, BC radios, hearing aids, etc.

Effects on the video may be varied. If a beat between the amateur's signal and the TV signal occurs, a cross-hatching may appear on the screen. If the beat frequency is low, this may show up as vertical bars across the picture. If the beat is high in frequency, it may be cross-hatching or simply a "grainy" appearance.

In severe cases, TV reception may simply be blotted out due to overload of the TV-set front end.

Video interference due to the amateur's audio modulation usually shows up as flickering horizontal bars of dark and light. This is true if the amateur uses AM. With FM, a cross-hatching which flickers in step with the audio occurs.

Cross-modulation interference may cause the sound of a local FM station to appear in place of the TV channel's sound, and it's possible for all these effects to occur at the same time (though highly unlikely).

9. Describe briefly the basic sections of a single sideband (SSB) transmitter. In what section of a properly operating SSB transmitting system is distortion most likely to originate? In what section is nonlinearity most likely to originate?

A. The basic sections of an SSB transmitter are the audio and sideband generation portion, the frequency control portion, and the power amplifier. The audio portion restricts audio from the microphone to the frequency range necessary for effective communication, and the sideband generator translates the frequency spectrum of the speech from the audio range into radio frequency (usually at some fixed frequency, to facilitate separation of the desired sideband). The frequency control portion translates the SSB output of the sideband generator into an SSB signal at the desired output frequency, and the power amplifier brings the signal's power level up to the desired point for radiation.

Distortion most usually occurs in the power amplifier portion of the transmitter. Nonlinearity, being a specific form of distortion, also is most likely to occur in the power amplifier, but may occur at any point within the transmitter. Once it occurs, it cannot be removed from the signal.

10. Define what is meant by the time constant in a resistance-capacitance circuit? How is the time constant determined?

A. The time constant is a measure of the speed with which the ciruit can react to step-impulse stimuli, and is a function of the product of resistance and capacitance in the circuit.

Time constant is determined by multiplying the resistance in ohms times the capacitance in farads, with the result being expressed in seconds. In practice, megohms and microfarads are the units usually used, with the result still coming out in seconds.

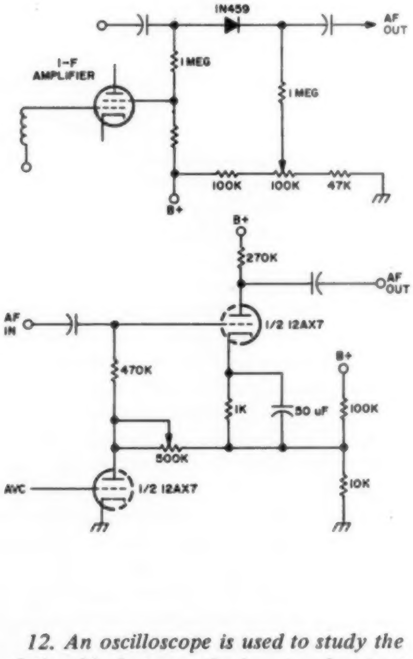
Time constant is sometimes defined as the time taken by the capacitor to reach 63% of full charge, through the resistance, and sometimes as the time taken by the capacitor to discharge to 37% of its original charge through the resistance. Both these definitions are accurate although incomplete.

As a working rule of thumb, an RC circuit will be essentially fully charged (or discharged, as the case may be) within 5 time constants, although in theory full charge or total discharge cannot ever be attained.

11. How does a squelch circuit operate? Draw a commonly used squelch circuit.

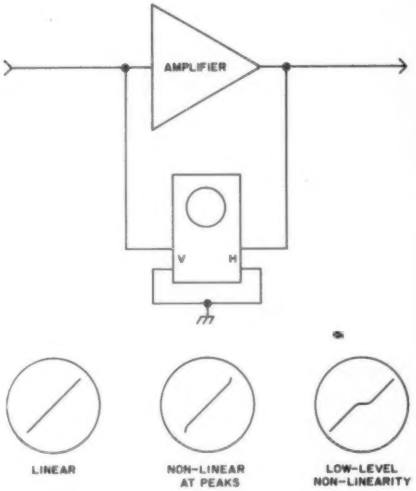
A. A squelch circuit acts to silence the audio output of a receiver in the absence of an incoming signal. Most often, the circuit either opens or shorts out the receiver's audio, between detector and audio amplifier, under control of a dc level obtained from the carrier of an incoming signal (usually the avc voltage). Some circuits, however, make use of "between-station hiss" to actuate the squelch.

Figure shows two typical squelch circuits, both operated from the avc line. When an incoming carrier causes an increase in avc level (more negative), the squelch circuit permits audio to pass through to the receiver's output.


IN459
AF OUT
I-F AMPLIFIER
1 MEG
1 MEG
100K
100K
47K
B+
B+
270K
AF OUT
AF IN
1/2 12AX7
B+
470K
1K
50 uF
100K
500K
AVC
1/2 12AX7
10K

12. An oscilloscope is used to study the relationship between the input and output of an amplifier produced by a voice signal. How would the scope pattern display a linear relationship between the input and output signals?

A. If the scope is hooked up as shown in Fig. , to directly compare input and output signals, a linear relationship would be indicated by a perfectly straight line on the face of the CRT. Any curvature in the CRT display would indicate loss of linearity at that point of the signal.

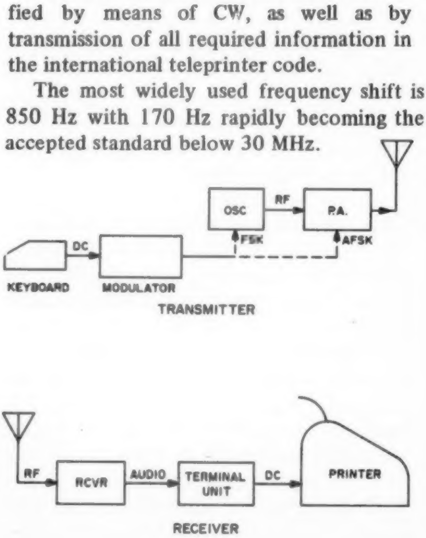

AMPLIFIER
V
H
LINEAR
NON-LINEAR AT PEAKS
LOW-LEVEL NON-LINEARITY

13. Draw a block diagram of an RTTY system showing the primary function of each stage. What is the proper way of identifying an RTTY transmission? What is the most widely used frequency difference between the mark and space frequencies in a conventional RTTY transmitter?

A. See Fig. for required block diagram.

An RTTY transmission should be identified by means of CW, as well as by transmission of all required information in the international teleprinter code.

The most widely used frequency shift is 850 Hz with 170 Hz rapidly becoming the accepted standard below 30 MHz.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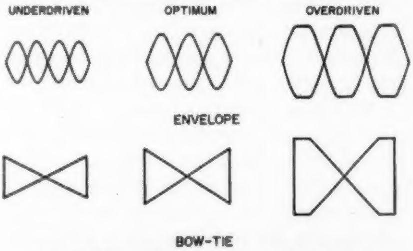
14. How can the two-tone test output of a linear amplifier be used to tell if a transmitter is working properly? Show scope patterns for optimum, overdriven, and underdriven amplifier conditions.

A. The scope patterns produced by the two-tone test can be used to determine the audio input level at which peak flattening occurs in the output signal as shown in Fig. (in Fig. , the "optimum" condition is just prior to the point at which peak flattening begins to occur).

Some additional information may be obtained from a modulation-envelope display of the two-tone test, but it is highly subjective. More accurate data on transmitter working conditions is obtained from the "bow-tie" display. In this pattern, curvature of the sloping sides indicates nonlinearity. Flattening of the tips of the pattern indicates overdrive. With proper bias conditions, the crossover will be sharply defined; if bias adjustments are incorrect, curvature will occur near the crossover point although the remainder of the pattern may indicate perfect linearity.



15. Define the alpha cut-off frequency of a transistor. How is this parameter of use in circuit design?

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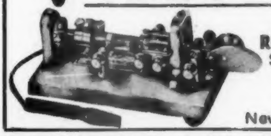

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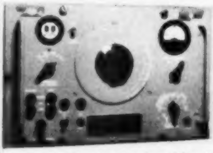

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A. The alpha cut-off frequency is that frequency at which "alpha" (common-base current gain) of the transistor drops to 71% (3 dB down) of its value at "low frequency" (normally 1 kHz). In other words, it is a measure of the high-frequency performance of the transistor.

Alpha cut-off frequency has little application to current circuit design, because the common-emitter circuit is more commonly used. It is, however, usually higher than the corresponding cut-off frequency for common-emitter circuits, and indicates the maximum frequency at which the transistor may be useful in amplifier, oscillator, and switching circuits. Normally, a transistor will oscillate readily at its alpha cut-off frequency, but may not function properly as an amplifier at this frequency.

16. What are inductive and capacitive reactance? How are their phase angles related? How does their reactance affect actual power dissipation in a circuit?

A. Reactance is a measure of the opposition to flow of alternating current. Inductive reactance is a measure of the opposition offered ac by an inductor, while capacitive reactance measures the opposition offered by a capacitance. Unlike resistance, reactance dissipates no power, but merely shifts the phase of current with respect to voltage, thus making a part of the power unavailable for dissipation.

Pure reactance of either type shifts phase by 90 degrees. With inductive reactance, the current lags the voltage by 90 degrees, and with capacitive reactance, the voltage lags 90 degrees behind the current.

In a circuit containing both reactance and resistance, only the resistance dissipates power. The power dissipation is reduced by presence of the reactance, because it makes a portion of the available power unavailable to the resistance.

Inductive reactance increases with frequency, while capactive reactance decreases with frequency. Thus at dc, an inductor is a short circuit while a capacitor is an open circuit, and at "infinite" frequency, the roles are reversed.

17. How does the positioning of a powdered iron tuning slug affect the frequency of the oscillator it is tuning?

A. Since the powdered iron slug has higher permeability than does air, as the slug moves into the coil it increases the inductance and thus lowers the frequency of the oscillator.

Brass has lower permeability than air, and is sometimes used for tuning slugs. When a brass slug is used, inductance decreases and frequency rises as the slug is inserted into the coil.

18. Define the deviation ratio in a frequency modulated signal.

A. Deviation or "swing" is the difference between the apparent instantaneous frequency of the modulated-signal envelope and that of the carrier. Deviation ratio is the ratio between deviation and the frequency of the modulating signal. Strictly speaking, it is the ratio between maximum deviation, and the maximum modulating frequency. In an amateur NBFM signal below 52.5 MHz, with maximum modulating frequency of 3 kHz, deviation ratio is not legally permitted to exceed 1.0.

19. What type of signal will be produced when the output of a reactance modulator is coupled to a Hartley oscillator and multiplied in frequency?

A. FM.

20. How would the reception of a single sideband signal be affected if the carrier is not completely suppressed? How can spurious signals in the output of the mixer stage of an SSB transmitter be suppressed?

A. The incompletely suppressed carrier may produce a beat frequency with the receiver's bfo if tuning is not exact. This beat appears as a low-pitched "growl," and may vary slightly in frequency as propagation effects shift the frequency of the incoming signal, or the bfo shifts slightly. In addition, the carrier may cause interference to other signals.

Spurious signals in the output of the mixer stage can be suppressed by proper design, by choosing input frequencies so that no mixer products except the desired one fall within the range of the output tuning circuits, and by the use of many selective tuned circuits between mixer and antenna. High-level mixers are to be avoided in the interest of suppression of spurious signals. . . .Staff

(to be continued in the May issue of 73)

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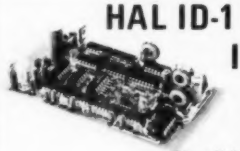

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The Poorer But Wiser Ham's FM Base Station

By this time FM is clearly here to stay and the confirmed FM addict wants at least a mobile and a base station, if not a walkie-talkie as well. The older, tube-type, commercial sets, although obsolete for their original intended purpose, offer the ham excellent sensitivity, power, and stability, and unless they are positively ancient, they offer a narrow passband as well. The latter is advantageous when you are digging for weak stations, assuming they are on frequency.

Since most of the commercial gear was mobile (there being as many as fifty mobile units for a single base station in some installations) it follows that an obsolete mobile unit is the cheapest and most available rig today. While much of this is hard to modernize into useable mobile material, all of it is easy to rebuild into base stations.

Now, as in other branches of the ham art, you will have to do a little extra work if you want to save extra money. For instance, as with the old recipe for bear steak that starts "first catch a bear," you must first find an old radio. This is easier to do than you might think just from reading the magazine ads, because the prices which the General Electric Pre-Progs, Motorola 80 D's, and similar rigs bring do not justify advertising them. However, find a firm that advertises more recent gear, write them or drop in at their warehouse and you will usually find the older, cheaper gear there and sometimes almost for the asking. Another good method is to have a friend inquire over the air, or check the goodie-row offerings at your nearest hamfest. At one last month, I bought a good Link 1905 receiver for $1. With $1.60 for two crystals from JAN and odd parts from my well-stocked junk box, it is now a serviceable 76–94 monitor receiver sitting in my bedroom. This is admittedly a better than average bargain, but you will be astonished at how much radio you can buy for how little if you go back about two model styles. I have bought working sets for $40 and you-fix-its for $5. See page 50, July, 71, issue of *73* for a representative list of dealers, or leaf through any current copy for others. If they advertise current type-accepted commercial FM gear, they probably have the less expensive earlier stuff, also.

There is no problem at all in getting circuit information and specifications for ordering crystals if you use either General Electric or Motorola gear, as there are books of prints advertised in the ham magazines nearly every issue. If you play with Link, RCA, Bendix, and some of the others, you may have to canvass the local ham fraternity for circuit data, but most hams will cheerfully let you Xerox any prints or instruction books they have, so do not fear the other makes, just prepare to do your homework if you use them.

Possibly the best buy is the GE Pre-Progress line (ES 12, etc.). These were six-volt units to begin with, although some were modernized in various ways to 12. Later models came in original 12 volt condition, but this is not really an advantage when you decide to convert to 110 ac, and you might save money as well as work by buying a six-volt model.

The advantage, other than cost, of the six-volt models is that the filaments are all in parallel. Whereas the original tube line-up employed low current tubes wherever possible (6BH6, 6BJ6, etc.) if you have a parallel filament circuit, you can substitute other tubes for increased gain, or just because they are more available. In the 12 volt versions, you must be sure the filament currents match properly on each side of the string or some tubes will be starved while others are over-fed. In addition to risking early tube burnout, such discrepancies can do strange things to stage gain which will be hard to find.

The first thing to do is separate out the leads which must be fed low voltage dc, such as the relays, and those which can use ac, such as the filaments. A choice is available in supplying the high voltage, as follows: You can pull the vibrator out, feed low voltage ac to the old vibrator transformer primaries, and diode-rectify the secondaries. However, you will recall that the vibrator transformers expected 120 Hz ac from the vibrators, and used a divided primary. If you run 6 volts ac to half the primary, you will come up with about the right secondary voltage, but the transformer may become too warm. This varies from model to model and from make to make. The Link 1905-1906 series had husky transformers that run barely warm this way, but the GE rigs were engineered fairly close and run warm, while some other makes will actually burn up. However, if you have the ac in sufficient quantity to feed them (6 volts at up to 30 amps!) you can easily try this method and see whether the vibrator transformers will handle it. If they do, you are home free, or almost so. You still must supply dc to the relays, and the easiest way is to use a bridge rectifier across a filament winding, if it is not grounded. A separate low-current filament transformer may be required With such a bridge rectifier, you may need no filtering. If you use a half wave across the regular grounded filament winding, you will need beaucoup capacity to keep the relay from chattering, but either method works.

There is a power limitation in using the old vibrator transformers as described. The GE Pre-Progs, for example, used two transformers, one for low voltage and the other only for plate voltage for the 2E26 final. The rig was planned for 7–10 watts output and that is about all that little transformer can produce. It does not help much to bridge it, because the increased current drawn will drop the voltage so that you are back about where you started. However, this rig can readily be "high-powered" if you build a new high voltage supply operating directly from the ac mains. To do this most easily, you pull out the old vibrator sockets and their transformers, leaving the electrolytic cans, as they will serve in the new supply. Either on the chassis, if you pick the right size, or somewhere else, you mount a TV transformer and bridge rectify it for the final plate supply, using the center tap for the general low voltage supply for the rest of the rig. FM transmitters do not require nearly as good filtering as do AM or sideband gear, so you need only add a new 8μF 1,000 volt oil filled paper capacitor for the final plate supply.

Since you will be using about double the old plate voltage, you might as well substitute a 6146 for the 2E26 and get the added wallop it can produce. Some Motorolas used two 2E26's and you can plug in two 6146's in place of them directly. If you try this on the GE ES16, you will find that the sockets are too close together. Take heart. Simply remove the metal shields from the bottom of the tubes (carefully!) and then file a flat side on each tube base where they would otherwise touch. (One tube will be for the right hand side and the other for the left hand side, not interchangeable.)

On any such gear, inspect the high voltage bypass capacitors closely, because most of them will not stand doubling the ratings, as we are now doing. Be sure also that any dropping networks deriving voltage from the final high voltage supply are correctly reengineered. On most sets, this latter is unnecessary as the manufacturers did not want to waste any more power than they had to waste, and so the high voltage supply (vibrator or dynamotor) delivered only its full output to one terminal.

This may sound like a lot of work, but actually it should take only a few evenings, even if you have never done it before. The result will be a high quality signal at good power and minimum cost. With crystals, the new power supply components, and the usual number of tubes and other repair parts, it should never exceed $75, but don't judge it only by the present cost. Remember, this old mobile junk originally cost upwards of $1,000!

One of the happiest accidents about the Pre-Prog receivers is that while they were originally designed for wide-band reception, the loading on the i-f coils is such that if you merely peak every coil precisely on frequency ("Christmas tree them") you will achieve a pass band about 15 kHz overall which is highly compatible with modern narrow-band equipment. The overall gain, of course, improves in this process and the receivers are quite satisfactory without additional preamplification, although putting a good transistor preamp ahead of them makes them as hot as you could possibly want. Originally rated at .6μV for 20 dB of quieting, when the i-f strip was stagger-tuned to 120 kHz wide band service, returning brings most of them to .5 or better, and a pre-amp drops them to .2 or .3. The squelch action is uniformly good.

One additional modification which I heartily recommend, but which is certainly optional, is junking the typical carbon mike in favor of a reluctance, ceramic, or other better-sounding type. If you rework a Pre-Prog in this way, you can get an added advantage of a well compressed audio signal as well. Remove the mike transformer and you will find that the hole in the chassis exactly fits a 9 pin socket. Wire a two-stage triode amplifier here, using a 12AT7 or equivalent, and feed the resulting signal to the existing audio tube, just as if it were coming from the secondary of the mike transformer. The easiest way to do this is with a 9 pin Vector socket, so the two entire stages can be built externally and then just set in place. It does require a special shield that mounts on top of the chassis, but I always use a 35mm film can instead, because they are more available (punch holes in it for ventilation!).

This will now drive the modulator tube into compression, and when you set the deviation control to the proper point, you will have a high-average, or loud-sounding, though narrow, signal. The gain required of the first stage depends on the mike; so try a 12AX7 and a 12AU7 in the socket before you quit, and select the one that gets you the best on-the-air reports. . . .WA4UZM

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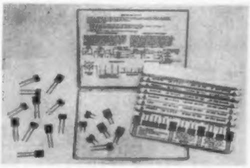

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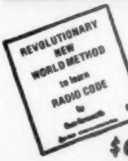

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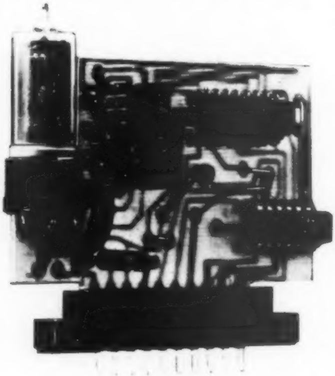

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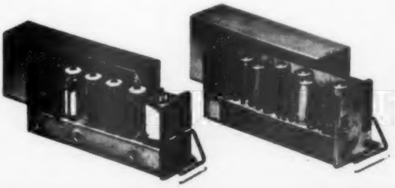

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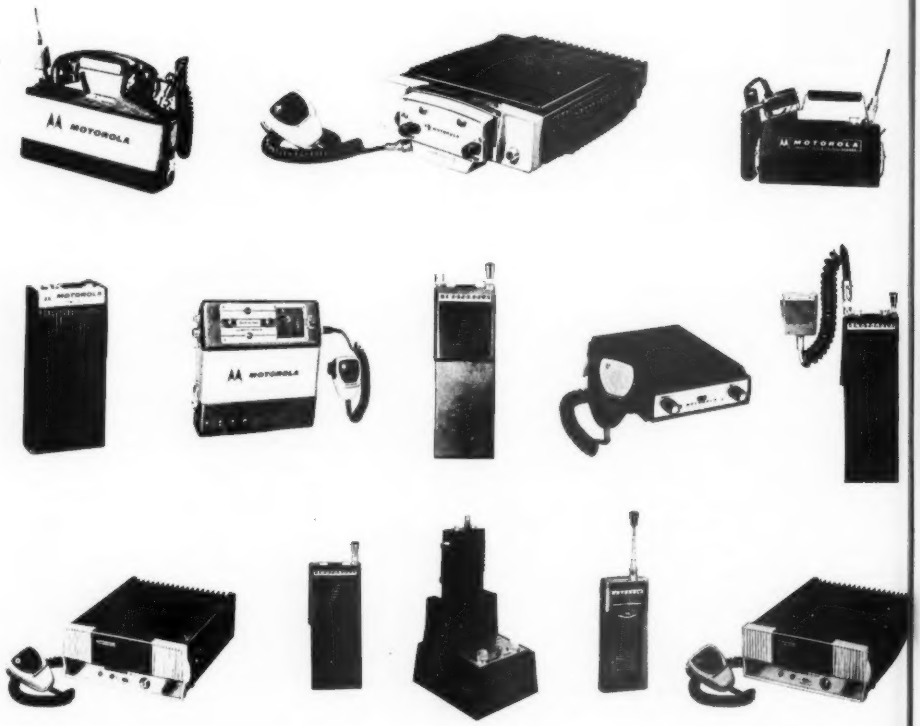
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☐ 2.5K
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April 1972

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$\boxed{2}$	3	4	$\boxed{5}$	6	7	8
9	10	⑪	$\boxed{12}$	13	14	15
16	⑰	$\boxed{18}$	$\boxed{19}$	20	21	22
$\boxed{23}$	$\boxed{24}$	$\boxed{25}$	$\boxed{26}$	㉗	㉘	㉙
㉚						

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14	14	7A	7	7	14	21	21	21	21A	21
AUSTRALIA	21	14	7B	7B	7B	7	7	14	14	7B	14A	14A
CANAL ZONE	21	14	7A	7	7	7	14	21	21	21	21	21
ENGLAND	7	7	7	7	7	7	14	14	14A	14	14	14
HAWAII	14A	14	7B	7	7	7	7	7B	14	14	14A	14A
INDIA	7	7B	7B	7B	7B	7B	14	14	14	14	14	7
JAPAN	14	14	7B	7B	7B	7	7	7	7	7	7B	14
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PHILIPPINES	14	7A	7B	7B	7B	7B	7B	7	7	7A	14B	14
PUERTO RICO	14	7A	7	7	7	7	14	14	14	14	14	14
SOUTH AFRICA	14	7A	7	7	7B	14	21	21	21	21	21	14
U. S. S. R.	7	7	7	7	7	7B	14	14	14	14	14	7
WEST COAST	14A	14	7	7	7	7	7	14	14	14	14	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14	14	7A	7	7	14	21	21	21	21A	21
AUSTRALIA	21	21	14	7B	7B	7	7	14	14	7B	14A	21
CANAL ZONE	21	14	14	7	7	7	14	14A	21	21	21	21
ENGLAND	7	7	7	7	7	7	7B	7B	14	14	14	14
HAWAII	21	14A	14	7B	7	7	7	7	14	14	21	21
INDIA	14	14	7B	7B	7B	7B	7B	7B	7	14	14	14
JAPAN	14	14	14	7B	7B	7	7	7	7	7	14	14
MEXICO	14	7A	7	7	7	7	7	7A	14	14	14	14
PHILIPPINES	14	14	7A	7B	7B	7B	7	7	7	7A	14B	14
PUERTO RICO	21	14	7A	7	7	7	14	14	14A	21	21	21
SOUTH AFRICA	14	7A	7	7	7B	7B	14	14	14	14A	14A	14
U. S. S. R.	7	7	7	7	7	7B	7B	14	14	14	14	7

WESTERN UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	21	14	7A	7	7	7B	14	21	21	21A	21
AUSTRALIA	21A	21A	21	14	14	14	7	7	7A	7B	14A	21
CANAL ZONE	21	14	14	7	7	7	7	14	14	21	21	21
ENGLAND	7B	7	7	7	7	7	7	7B	7B	14	14	14
HAWAII	21	21	21	14	14	14	7	7	14	21	21	21
INDIA	14	14	14	7B	7B	7B	7B	7B	7	7	14	14
JAPAN	14	14	14	7A	7B	7	7	7	7	7	14	14
MEXICO	21	14	7A	7	7	7	7	14	14	14	14	14A
PHILIPPINES	14	14	14	7A	7B	7B	7B	7	7	7A	14	14
PUERTO RICO	21	14	7A	7	7	7	7	14	14	14	21	21
SOUTH AFRICA	14	7B	7	7	7B	7B	7B	7A	14	14	14	14
U. S. S. R.	7	7	7	7	7	7B	7B	7B	14	14	7A	7
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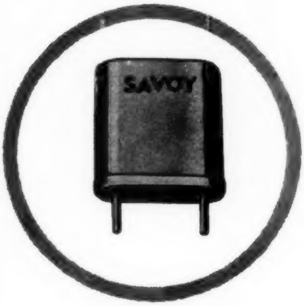

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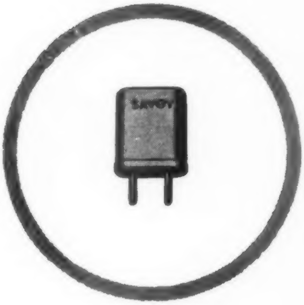

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